Light and Portable Railways.

Written for ENGINEERING NEWS.

BY EDWARD E. R. TRATMAN.

One of the first considerations in establishing a new town, mine, mill, etc., or in opening up a new lumber or other district, is the all important one of railroad accommodation, and one of the first works to be executed is the building of a line from the nearest available working railroad direct to the town or other site. In most cases a line of more or less (frequently less) substantial construction on the ordinary system is adopted, or perhaps a narrow gauge line is chosen as being cheaper, but a very common result is a crude and awkward line of communication, worked with locomotives and rolling stock of much the same type as those in use on better made roads, the whole affair being often rough, unsatisfactory and uneconomical, and though it may at first fulfill the immediate requirements of the case it soon comes to be considered on its merits, with disappointing results. In cases where any extensive amount of traffic is likely to come upon the branch from its trunk line, or where the line is to connect two existing roads, the gauge and method of construction might with advantage be made the same as the older roads. In some instances, however, where the district to be accommodated is but little populated, but where a line is required for special purposes, or where the traffic is small, or a line of communication is necessary for any particular reason, it may be found that the cost for the building and working of even the cheapest form of railroad of ordinary gauge and construction, would be considerably in excess of that which would be warranted by the amount of traffic to be accommodated.

In such cases it may probably prove advisable to lay down a line of "light" railway of narrow gauge, either of the portable, semi-portable or permanent class as may be most suitable. The gauge of such lines varies from 18 inches to 36 inches and the weight of rails from 10 lbs. to 20 lbs. per yard for the lighter and from 20 lbs. to 40 lbs. per yard for the more permanent class; but 15 lbs. per yard is the minimum weight for even the lightest class when it is proposed to employ locomotive traction. The rails may either be permanently secured to the sleepers as in the Decauville system, or may be quite separate as in Greig's and most other English systems. M. Decauville, however, claims for his system that the rails and sleepers of each length of track being riveted together have only to be laid as they stand, that it is lighter and more portable, and is, moreover, free from the cost of maintenance inseparable from systems having the rails secured to the sleepers by bolts, keys or other methods; the sleepers in this system do not project beyond the rails except in special cases. The rails are almost invariably of the Vignolles, or flat-footed type, with cross sleepers of buckled or dished plates of iron or steel, or for the more permanent classes sleepers of inverted trough section are employed, while longitudinal and pot sleepers are also occasionally used. In the lighter classes fish bolts are not required, but for the heavier ones the ordinary type of fish joint is employed, or an extra sized sleeper having a specially designed joint.

In the case of the permanent type the line would require some amount of earthwork, etc., to obtain suitable gradients and curves, but this amount would be insignificant as compared with that for the roughest type of ordinary construction, while the distance not being a matter of such importance, the route may be wound around to avoid very heavy works, though, of course, in a severe country certain bridges, etc., would be required; these, however, would be of very light construction and almost invariably of timber, and in lumber regions would cost but little. The rails would be separate from the ties, the riveting together of tie and rail being only an advantage in the portable system; the ties would be of dished steel, or for the heavier rails probably those of trough section would be preferable. The line would for the most part be laid on the surface of the ground, rough inequalities being levelled to form a fairly smooth roadbed, then packed tight with earth and perhaps turfed to render the bed firm and durable. Such a line would be able to accommodate a considerable amount of traffic, both of freight and passengers; the gauge and other details being varied to suit the requirements of each individual case. The locomotives, which should have side tanks instead of a tender, would weigh from four to six tons, and the cars would be suited to the nature of the freight, passenger cars being also used. The speed on such a line of fair construction would vary probably from eight miles an hour for freight and ordinary trains to twelve or fifteen miles per hour for express trains. Stations would rarely be necessary.

For the semi-portable class less trouble would be required for construction, and the speed of trains would consequently be lower, yet for many cases this class of line would answer to the full as well as the permanent class.

The portable class is adapted for light passenger traffic, for agricultural and manufacturing uses, to haul lumber, to transport sugar cane from the plantation to the mill and the sugar hogsheads to the ship or the railroad, to carry clay from the clay pits to the moulder and thence to the kiln, and again to take the burnt bricks from the kiln to the railroad, and for innumerable other purposes. This system has been largely used in Europe on extensive works and for farming operations; its range of usefulness is almost boundless and the expense extremely small when compared with its great convenience. The track, composed of lengths of about 16 feet of rails with ties connected, is laid down on the surface of the ground and can be moved wherever necessary to keep near the work; for ordinary farms and small works horse traction is usually employed, but for lines of any extent locomotives would be advantageous, should the nature of the country permit of their use. Iron and steel are universally employed in every department, to the almost total exclusion of wood, so as to ensure the greatest amount of durability and strength, while the track, cars, etc., are all designed for lightness and portability as well as strength.

This system, so generally useful and of such wide application, and capable of accomodating a large amount of traffic is worthy of consideration and deserves to be used to a much greater extent than it is at present in this country. Its capabilities vary from opening communication between towns and villages, and between up-country towns and the nearest main line, to enabling farmers to haul their wheat, etc., easily and rapidly from field to barn and from barn to railroad, and get their manure, etc., in return direct from the town or railroad into their yards; it enables contractors to haul their materials, or mine managers to transport their coal or ore to any required point, and meet requirements of ordinary farms or small works, besides being extremely suitable for temporary purposes.

Portable railways have been and are used at the extensive works of the Port of Antwerp (Belgium), the Newhaven (England) harbor works, the French Channel Tunnel works, on sugar plantations and various other works, including the Panama Canal, where there are over 30 miles of line and 2000 wagons; the track is 20 in. gauge, composed of 14 lb. rails in 16 ft. 5 in. lengths rapidly connected to the ties, each length weighs about 170 lbs., and the wagons hold 18 cu. ft. and can be tipped on either side. They are also of importance from a military point of view, the Russian and French Government particularly having made considerable use of this description of line in various campaigns. In a pamphlet issued by M. Decauville, to which I am indebted for much of the information relating especially to his system, I find it mentioned that in the Russian campaign against Turcomans, 67 miles of railway, 20 in. gauge with 14 lbs. rails, were laid to convey supplies and troops; Kirghiz horses were used and drew with ease an average about 2000 lbs. 25 miles a day. In the French Tunisian campaign a line of 24 in. gauge, with 19 lb. rails, was employed and though the severe grades precluded the use of locomotives, horses were able to perform more than twelve times as much work with the railroad cars as with ordinary vehicles; the wagons over this line were about 13 ft. long by 4 ft. wide, and could be used as freight cars, as ambulances for eight persons, or as passenger cars seating sixteen persons. Guns were also conveyed on this line. In Tunis there is now a line 40 miles in length, working regularly between two cities, the distance being accomplished in five hours; and the British expedition which is about to start for Khartoum will take with it materials for the laying and complete equipment of a portable railway, 18 in. gauge, across the desert, to convey both troops and supplies. The system has also been of service in African explorations and other expeditions.

As to the cost, I am unable just now to give definite figures concerning the expense in this country: a mile of track, however, such as above described as in use on the works of the Panama Canal, with 16 wagons and all appurtenances, cost about £700, English, ($3,500), the total weight being about 35 tons; and a mile of 20 in. gauge track, such as is used on sugar plantations, with 14 lb. rails, 30 basket wagons and all necessaries for the transport of cane, would cost about the same and be approximately the same weight. A line in South America, 6 miles in length, gauge 24 in., with 19 lb. rails, 30 passenger and freight cars, and two locomotives, cost about £7,500 ($37,500).

As yet this class of line is but little beyond its infancy, but I think it must be evident that its use and capabilities are so extensive and efficient that it should be destined to a considerable future, being especially suited to the requirements of the western and other comparatively new portions of this country.

I should be glad if this paper, imperfect as it is, might bring this system of railroads into greater notice, convinced as I am of its importance and shall be pleased also if it should produce letters or other information from parties interested in any way in the subject, while should it meet with approval I hope later on to supplement it by a more detailed article.

Tests of Delta Metal.

The following are the results of tests made at the Imperial Testing-Works in Germany, by order of the Deutsche Delta-Metall Gesellschaft, Alexander Dick & Co., Düsseldorf. The elasticity of Delta metal per square inch was proved at 31,757 lbs. equal to 14.1 tons: the commecenment of permament set per square inch was 49,757 pounds, equal to 22.2 tons: the breaking strain per square inch was 80,658 pounds, equal to 37.34 tons; the elongation was 12.9 per cent, and contraction of area of fracture 17.4 per cent. The crushing test, by a stress of 22,000 pounds, gave 0.80 per cent; 44,000 pounds. 0.33 per cent; 66,000 pounds, 2.03 per cent; 77,000 pounds.2.71 per cent; 88,000 pounds, 3.87 per cent; 99,000 pounds, 5.77 per cent; 110,000 pounds 8.20 per cent; 121,000 pounds, 10,76 per cent; and 132,000 pounds, 13.41 per cent; the ultimate stress per square inch was 135,700 pounds, equal to 60.5 tons. Some bearings have been recently stamped from this metal for one of the great English railroads. They are struck at a dull-red heat, and come out with fine sharp edges, ready for immediate use, and are free from blow-holes and flaws, and possess the strength of Bessemer steel. This latest developement shows the growing interest that is taken in Delta by those who use vast quantities of metal.

A Blast Furnace with Bosh Water-Jacket and Iron Top.*

BY ARTHUR P. WENDT, NEW YORK CITY.

Within the last few years the production of iron, and of the metals generally, by a given furnace plant, has been largely increased, in many instances trebled. Iron furnaces exceeding 100 tons' capacity per diem are now the rule in new constructions. Copper and lead furnaces, smelting from 60 to 100 tons of ore per day, are common. With this greatly augmented product, the life of furnace linings has been diminished, and recourse has been had to various cooling devices for prolonging the life of such linings. The object of this paper is to call the attention of the profession to an arrangement recently patented by the writer.

The common course of projecting water against the exterior of the brickwork of a furnace, has been in a large measure abandoned by our most progressive managers. All have recognized the danger of this proceeding, especially when applied to the crucible of a furnace below the line of the tuyeres. Cast-iron water-jackets, with wrought-iron pipes for circulating the cooling water have replaced the cruder methods. In iron smelting the use of

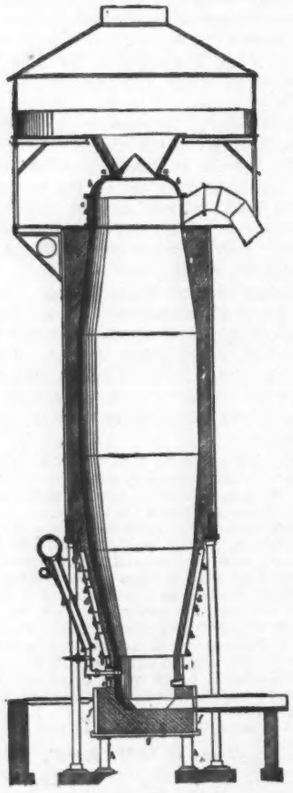


FIG. 1.

such jackets has been confined to the crucible and the space around the tuyeres; and it has been the custom to support the jackets on the brickwork of the furnace. But the erosion of the brickwork below tuyeres-jackets allows them to sag, and often displaces the alignment of the tuyeres and leads to other annoyances.

The principle of construction, adopted by the writer to remedy this and other evils, is to use a thin fire-brick lining (not over 9 in.) from the tuyeres up to the bosh, to back this lining with wrought-iron or steel water-jackets, *hung* from the mantel-ring, and thus to carry the whole weight of the furnace and its filling upon the supporting pillars. The crucible proper is lined with three or four thicknesses of fire-brick on the sides, and not less than 48 in. in the bottom. It is supported on independent pillars, and is practically an independent structure. It could even be placed on wheels and made removable, were there any adequate advantage to be gained by such an arrangement.

*Read at the Chicago meeting of the American Institute of Mining Engineers, May, 1884.

By reference to Fig. 1, a set-off in the lining will be seen below *e,e* by reason of its increased thickness below the tuyeres water-jacket.

The water jackets *e,e* hang from the jackets *d,d*, and these are in turn hung from the mantle-ring.

The jackets *f,f*, encircling the crucible lining, rest on the plate *g*, supported by the pillars *h*. An essential point of this construction is the annular space left between the jackets *e,e* and *f,f*. Through this the interior of the crucible can be reached, and the crucible lining can be repaired without blowing out the furnace. It is immediately below the jacket *e,e* that the cutting action of the molten cinder is the greatest; and it is this space that can be most readily reached from the outside.

Inspection of Fig. 1 will show that the blast pipe is carried very high, and the branches from it are built in two flanged sections. In case of a scaffold, the tuyeres can be instantly raised, and the furnace blown in at a higher level, through openings left for that purpose in the bosh water-jacket.

The level of the ground is some 10 ft. below the bottom of the crucible; and the level of the sand beds, and the top of casting house walls are carried to this height above the surrounding country.

From the bosh to the tunnel head, the furnace presents no novelties. Above the brickwork of the tunnel head, the construction is entirely of iron, and differs widely from that usually adopted.

There are two floors supported by brackets attached to the shell of the furnace. Resting on the lower floor are the heavy iron columns *c*, supporting the dome *b,b*. Closing the spaces between the columns are thin cast plates, firmly keyed to the columns. It is against these plates that the stock strikes, upon the lowering of the bell, thus effectually preventing the wear of the brick lining near the tunnel head. Members of the profession will remember several instances where this wear has given trouble, and accidents have happened as a consequence.

The charging hopper hangs from the charging floor, and its lower edge overlaps and rests on the circular angle piece *a,a*. This angle piece is turned true, and makes a gas-tight joint with the bell. It is cast in three or more flanged segments, which are bolted together and keyed fast to the top of the dome *b,b*. In the event of the edge of the angle piece chipping off or being otherwise destroyed, the segments can be readily removed and replaced by others.

Should the furnace be blown out, the plates *c* are removed, the hopper is filled with water, and a spray of water is kept on the dome. It is also advisable to charge some limestone during this operation, both to deaden the flame at the tunnel head, and to facilitate the shoveling out of the last material remaining in the furnace. In smelting ores of iron, copper or lead, containing an appreciable amount of zinc, an iron top relieves all annoyance experienced from the accumulation of cadmia. The zinc condenses against the iron and can be removed without trouble.

Fig 2 shows the general arangement of 36-in. water-jacket copper-smelter of the type now common throughout the West, arranged according to the writer's improvement. No lining whatever is used in the shell. The crucible is built up of fire-clay, rammed into place. The bottom of the furnace can be dropped, as is usual with iron-cupolas.

Lead-furnaces are constructed on the same general plan.

To iron-masters not acquainted with the practical operation of water-jackets, it might seem that by their use a large loss of heat is occasioned. But this cannot be the case, as a little reflection will readily prove. The bosh of an iron-furnace, especially that part immediately around the tuyeres, invariable cuts out, sometimes within a few days after going into blast, until the lining has become very thin, and the tendency of the heat to destroy the material is checked by the loss of heat by

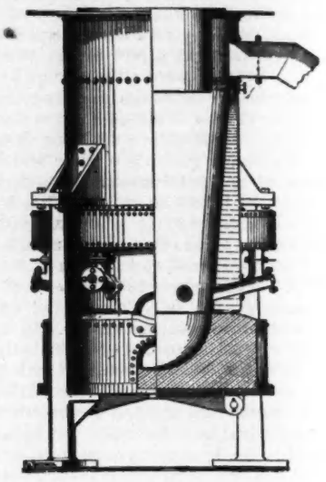


FIG. 2.

conduction from this material itself. Now whether this loss of heat is conditioned by the surrounding air or is controlled by a circulation of water, can make no difference in the fuel consumption. To preserve a certain thickness of brick a certain number of heat-unit must be carried off.

The smelting process, however goes on much more uniformly in a water-jacket, which preserves the shape originally given to the interior, than in a furnace with thick walls cut into irregular shape by the heated stock and cinder. Thus an actual saving of fuel may ensue.

The principle of construction described can be readily applied to many existing furnaces, by raising them bodily and replacing the old-fashioned short pillars, under the mantel-ring, with long wrought-iron ones.

NOTE.—Since the writing of the foregoing paper, an iron-furnace to which the writer had applied the water-jacket has been blown out. The brickwork on the jacket is from six to nine inches thick, and the furnace has there preserved its shape. The bosh has a smooth surface, and no re-lining is required. Above the bosh the lining has been cut irregularly. Around the tuyeres no brick-lining remains; and the furnace has been running on a slag-lining.

Adulteration of Cement.

According to Messrs. Fresenius, Portland cement is usually adulterated with hydraulic lime and furnace slag, and those able chemists have devised the following test in order to detect these adulterations:—The specific gravity of cement lies between 3.12 and 3.15, while that of hydraulic lime is from 2.44 to 2.55, and that of slag from 2.87 to 3.01. Pure cement, even after lengthy exposure to air, loses at the most 2.6 per cent. on ignition, while lime loses from 18 to 19 per cent. If 0.5 gram of the substance in the shape of finely divided powder be with 50c.c. of cold distilled water, it gives heated a solution which, in the case of slag, is practically devoid of alkalinity, whilst the lime solution requires about 20c.c. standard acid for its neutralisation, that from cement requiring from 4 to 6.2 c.c. Boiled with dilute sulphuric acid 1 gram of the substance yields a solution that will decolorise only a few drops of normal permanganate solution in the case of cement and lime, but large volumes in the case of slag. Again, hydraulic lime absorbs carbonic anhydride (1gram, about 10 mg), whilst cement does not combine with that gas. Experiments made with mixtures containing 10 per cent. of adulterant readily give decisive indications with one on other of the above tests.

Engineering School Cambridge.

The new engineering school attached to the University of Cambridge has attracted a large amount of success. Professor Stuart was the originator of the school, and entirely at his own expense he fitted up some small workshops containing a few vices, some foot lathes for iron turning, some woodworkers, benches, and necessary tools. Skilled workmen were secured to teach the handicrafts, and the experiment rapidly became an assured success. Having demonstrated to the authorities of the University the practicability of his scheme, the Museums and Lecture-rooms Syndicate took the matter up, and since that time grants have been made from the University funds to enlarge the old workshops, to provide tools, etc. Application was also made for an assistant to the professor. This reasonable request was granted by the University, and resulted in the appointment of Mr. James Lyon, B. A., of Clare College, a graduate in mathematical honors, and who possessed also the more important qualification namely, being an engineer of some fifteen years' experience, the result of Mr. Lyon's appointment was to develop the scheme of the professor very rapidly. The workshops were found too small for the accommodation of the students, and the University authorities being again appealed to, new buildings were provided, and also additional appliances. There is now a foundry, smiths' and pattern-makers' shops, and a model engineering establishment in the very centre of the new museum buildings. The number of pupils continue to increase, and in the Lent term there were sixty-one. Professor Stuart reports that the average amount of work, both theoretical and practical, done continues to increase, and the work is of a higher standard than before. "I attribute," says Professor Stuart, "these results chiefly to the great ability, energy, and application with which Mr. Lyon, previously demonstrator and now superintendent, who now really manages the department, combines practical experience and theoretical knowledge in a manner rarely to be met with." Although the majority of the students are members of the University, others are admitted. Some of the members of the University have taken their degree, but the majority consist of those working to pass the University examination in mechanism and applied science. There is an excellent drawing office attached to the department, in which the students learn machine construction and designing, and they usually design some piece of mechanism which they are afterwards to make themselves in the shops. In this way one pupil has made a dynamo to absorb 6 horse-power, and this is being now used to light his father's house with electricity; another student has made a pair of steam-engines for a pleasure yacht; a third, a double geared lathe; a fourth, a mortising machine; a fifth, a circular saw bench, and so on. There is no restriction as to what the pupil embarks on, save that it must be some real piece of work, not a plaything, and also each pupil has to go through a preliminary course which is prescribed by the department for those who are quite ignorant of engineers' tools and the use to which they may be put. Among other things, philosophical instrument making is carried on to a large extent, electrical appliances are made and sent all over the world, while much work is executed for the different University laboratories, and the largest heliostat ever made has just been completed for Professor Liveing to enable him to examine the spectra of sun spots. With a view to making the work-shops attractive and useful to intending emigrants, one shop is devoted to cabinet-making and general wood construction, and this is found of great use to young men who intend to follow the pursuit of land and estate agents.

A completely new line has been entered upon this summer, which, no doubt, will be of great service to many of the pupils, to say nothing of the benefit to the University. A large addition had to be made to the premises of one of the scientific departments by building another story on the top of an existing museum, 120 feet long by 25 feet wide; but it was very undesirable to disturb the ceiling over this museum, which being nailed to the timbers of the roof, rendered the subject a difficult one to deal with. Under these circumstances, the University authorities asked the advice of the mechanical department, which undertook to do the work. The result of the undertaking has been a complete success, for the ceiling has been cut free from the roof, and the latter, weighing about fifty tons, has been lifted bodily a height of 12 feet without removing a slate. The whole work undertaken was estimated to cost 3,000*l*., and it is anticipated that a large saving will be effected on the estimate in consequence of the work having been carried out under the direction of the superintendent of the mechanical department.—*The Architect.*

Determination of Organic Matter in Potable Water.

Prof. J. W. Mallet, in compliance with the instructions of the National Board of Health, has made a thorough investigation of the Chemical methods in use for the determination of organic matter in the potable waters. Assisted by Mr. W. A. Noyes, Dr. Charles Smart, and Dr. J. A. Tanner, he examined the merits and demerits of the "combustion process," the "albuminoid-ammonia process," and the "permanganate process." The special conclusions as to the combustion process may be briefly stated. The combustion, itself carried out according to Frankland's directions, is a process of great delicacy and satisfactory in trained hands; it requires constant practice to secure good results; the defective point is the failure of the evaporation to leave residue representing the original organic matter of the water, a loss in carbon and a gain in nitrogen, being constant errors; the dissociation of ammonia salts during the evaporation occasions a loss of nitrogen; in the presence of nitrates the difficulties of combustion are great and as yet insuperable; finally, the combustion process cannot be considered as "determining" the carbon and nitrogen of the organic matter in water in a sense to justify the claim of "absolute" value for its results which has been denied to those of all other methods.

The special conclusions as to the albuminoid-ammonia process are as follows: In the determination of both "free" and "albuminoid" ammonia there is a loss resulting from imperfect condensation of the ammonia during distillation; when urea is present some ammonia is easily formed by boiling with sodium carbonate, and this vitiates the determination of "free" ammonia; in the distillation with alkaline permanganates the nitrogenous matter sometimes fails to be completely acted upon before the contents of the retort is nearly reduced to dryness, and great uncertainty results; the value of the results by this process depends more upon watching the *progress* and *rate* of evolution of the ammonia than upon determining its total amount.

The special conclusions as to the permanganate process are: The results obtained by the Tidy method, and by Kubel's modification of the same, differ irregularly, the latter usually giving much higher figures; the results obtained by the Tidy process are liable to variations with the atmospheric temperature prevailing at the time the process is applied; the amount of oxygen consumed cannot be taken as a measure either of the organic carbon or of the total organic matter, though a general resemblance may be traced between strongly marked results, high or low, for the consumption of oxygen on the one hand and inorganic carbon (by the combustion process) on the other; the process is capable of giving more valuable information by watching the *rate* and *progress* of the oxidation of organic matter present than by any single determination of the absolute amount of oxygen consumed in a given time.—(*Am. Chem. J.*, IV, p. 341.)

Raising a Wrecked Bridge at Douarnenez, France.

The viaduct in question crosses an arm of the sea at Douarnenez, France. It was a continuous girder 571 ft. long, with two piers dividing it into about three equal spans. The truss was of the ordinary lattice type.

The bridge was erected on shore and launched bodily on rollers. On Dec. 10, 1883, the forward end of the truss had almost reached the second pier, the overhanging portion equalling 177 ft. in length. At this point one of the axles in the rollers of the launching frame broke, and the truss weighing about 400,000 lbs. turned vertically about its support on the first pier as upon a hinge, and the forward end fell to the bottom of the sea, at this point about 72 ft. deep. The inner end remained tied to the top of the first pier by the crippled iron work.

It was at first thought advisable to sell the wreck for old iron and rebuild the fallen portions, but a closer examination showed that the truss had really sustained but little serious damage. At the pier-end the upper chord was elongated and torn somewhat, and the lower chord buckled for a distance of about 8 ft. At the outer end, which had sustained the shock of the descent, the trusses were distorted over a length of 16½ ft.; the intermediate portion was absolutely intact, showing no curvature or deformation whatever.

Taking into consideration these favorable circumstances, the engineer, M. Joessel, conceived the plan of raising the truss into place and repairing it without taking it apart. The tops of the piers were but a short distance above the water surface, and the problem was to raise a weight of about 350,000 lbs.—the crippled 16½ ft. having been cut off—a distance of 72 ft. The method adopted was as follows:—At the pier, where the fallen truss was still connected with the uninjured span, a hinge of wrought iron with steel pins was arranged, and the chords then cut so that the bridge was free to move in a vertical plane. A tower of timber work about 121 ft. was erected around the second pier and heavy chains attached to the sunken end of the truss passed over pullies on this tower and were anchored to a large suspended water tank having a capacity of 2800 cubic feet.

By filling this tank with water by a pump, the weight of the truss could be balanced by about 175,000 lbs. in the tank. The tank lever arm being twice the length of the truss lever arm, supposing the weight concentrated at the centre, the moments about the hinge were thus equal.

A slight surcharge of the tank would then suffice to raise the bridge with a movement uniform and easily controlled. But for further security and to enable the bridge to be stopped at any point that necessity might require, the load in the tank was so arranged that there was always an excess of weight of about 6 tons on the truss side, the required additional power being supplied by two hoisting crabs worked by hand.

Work was commenced on August 2 and after the load had been lifted slightly, it was left in this position for twenty-four hours to test the chains and hoisting apparatus. The next day, August 3, commencing at noon the truss was raised clear out of the water before evening; and the crippled portions being replaced the bridge was completed and opened to traffic.—*Moniteur Industriel.*

Experiments upon Explosives.

TRANSLATED FOR ENGINEERING NEWS BY GEO. J. SPECHT, C. E.

The Committee on Explosives, appointed by the Austrian Society of Civil Engineers and Architects, reported on Nov. 29, 1883, upon tests made with explosives by the lead-cylinder method. The explosives examined were as follows:—

Gelatine-Dynamite No. 1, (64.5 % explosive gelatine, 35.5 % mining powder).

Gelatine-Dynamite No. 2, (45 % explosive gelatine, 55 % mining powder). The explosive gelatine consisted of 97.3 parts nitro-glycerine, and 2.5 parts gun-cotton; the mining powder was made of 75 % of nitrate of potassa, 24 % of wood-pulp and 1 % of soda.

New Dynamite No. 3, (14 % nitro-glycerine, and 86 % mining powder), the latter consisting of 15 % sulphur, 70 % nitrate of soda, 14 % of charcoal and 1 % soda.

Two kinds of lead were used in the cylinders, one from Tribram, the other from Raibl, these being the principal sources of lead in Austria. Each explosive was fired in six different cylinders of each kind of lead. Each charge consisted of 20 gramms of powder; the caps contained a charge of 0.5 gramms of fulminate of mercury. The cubic contents of the opening in the lead cylinder, before the explosion, was 15 cu. centimetres. The following table gives the result of the experiments:—

Gelatine-Dynamite No. 1.		Gelatine-Dynamite No. 2.		New Dynamite No. 3.	
Lead from Tribram.	Lead from Raibl.	Lead from Tribram.	Lead from Raibl.	Lead from Tribram.	Lead from Raibl.
cu. cent.	cu. cent.	cu. cent.	cu. cent.	cu. cent.	cu. cent.
1243	1178	995	815	460	420
1247	1163	880	820	470	425
1200	1220	8 0	808	470	420
1249	1169	895	815	465	4.0
1219	1160	895	870	465	420
1214	1188	870	845	470	425
Avg. 1229	1181	886	834	466	425

The lower results given by the Raibl lead prove it to be harder than the Tribram lead. The variations in any one series are not so very great when we consider that the explosion is in effect a sudden blow which can hardly be exactly uniform in all cases.

The trials with pure explosive gelatine were not so satisfactory as the following experiment proves.

The lead cylinders used were similar in size to the above and the charge and caps were also the same. The results were:—

EXPLOSIVE GELATINE.

Lead from Tribram.	Lead from Raibl.
cu. cent.	cu. cent.
1290	1260
1290	1150
1250	1125
1120	1075
1260	1350
1870	1275
Averages 1347	1206

These figures do not present the same uniformity as in the previous experiment. It also appears that the enlargement caused by the explosion of the gelatine is not large enough when compared to that resulting from the use of the gelatine dynamite No. 1. The committee, therefore, report that gelatine, even in such small quantities as used at the trial, should be exploded by stronger caps or with extra primers, as is actually done in practice.

Later experiments with more powerful exploders resulted as follows:—

Lead from Tribram.		Lead from Raibl.	
16 gr. Gelatine. 4 gr. Gel.-Dyn. No. 1. 0.5 gr. Caps.	20 gr. Gelatine. 2 gr. Caps.	16 gr. Gelatine. 4 gr. Gel.-Dyn. No. 1. 0.5 gr. Caps.	20 gr. Gelatine. 2 gr. Caps.
cu. cent.	cu. cent.	cu. cent.	cu. cent.
1975	1915	1740	1760
1705	1790	1690	1790
1710	1800	1590	1640
2035	1885	1880	1735
1965	1780	1575	1690
1800	1835	1075	1635
Aver'g's 1865	1827	1725	1735

Even these results show deviations which are too great. The committee believes that the lead-cylinders, as used for the dynamites, were too small for the stronger gelatine. This was shown by the cylinders being deformed even on the outside. Trials with larger cylinders, in the case of the explosive gelatine, are to follow.

Wochenschrift Oesterreichen Ing. & Arch. Vereins. April 12, 1884.

Specifications for Dredging to be Done for the Improvement of Cape Fear River Below Wilmington, N. C.

(*Proposals Opened Aug.* 28, 1884. *See Abstract Page* 120.)

1. DESCRIPTION.—The amount available for dredging and attendant expenses is about $140,000.

It is proposed to complete a channel to 270 feet in width at the bottom, and 16 in depth at mean low water, from the deepwater near Price's Creek to Wilmington, wherever dredging is required, to obtain such depth and width. The greatest depth of cutting will be about 4 feet; average about 3 feet. The appropriation now available is sufficient for only a portion of the work.

The channel is now completed to the shoal opposite Ortin Point, known as Lilliput shoal.

The work now to be proposed for is to dredge a channel across each of the three remaining shoals, known or to be designated as the Lilliput Shoal. The Big Island and Log Shoal and the Brunswick River Shoal, opposite the mouth of the Brunswick River—to 270 feet width or such a width as the funds available will allow, and to 16 feet depth at mean low water.

The funds will be so apportioned as to allow for the dredging to be about the same width in each location, if there be not enough for the whole.

Bidders will state the price of dredging separately for each shoal. The work may be awarded to one or more parties. The work on the Brunswick River Shoal will be combined in the award with one or the other Shoals, the whole work to be finished during the present fiscal year.

2. MATERIAL.—The material to be dredged is mud, compact sand, shells and clay in various proportions and mixtures. Some stumps and logs are also expected on the Big Island and Logs Shoal.

Bidders must satisfy themselves as to the character of the excavation and work before bidding.

All stumps and logs must be removed at the price of other e cavation, excepting that the United States will pay Forty Dollars for each stump of a tree of twelve inches diameter or log twelve inches and upward in diameter, which may be found thoroughly imbedded in the excavation and removed therefrom by the contractor to such places as shall be designated by the engineer in charge.

3. The dumping will at all times be done under the direction of the Engineer in charge, and in water of five feet depth and upward of mean low water. The scows will be required to dump in the shoalest portions of tho dumping areas which they can reach. Access to the dumping areas can be had with at least 6 feet depth at mean low water.

4. TIDES.—The mean rise and fall of the tide is from 3 to 3½ feet.

5. MACHINERY.—All machinery to be used must be of approved make and good repair. Scows must be sound and tight, and the whole apparatus maintained in sound working order at all times.

6. MEASUREMENT.—The material excavated shall be deposited in scows, whose capacity shall be determined by measurements made by the Engineer in charge, or his agent, before the work is begun. The duty of determining when such scows contain full loads shall devolve upon Inspectors appointed by the Engineer, and the decision of said Inspectors, acting under orders of the Engineer, as to the amount of material removed, shall be final and without appeal on the part of the contractors.

Proposals will be entertained for measurement of dredging in excavation to be determined by soundings before and after the dredging is done. In comparing such measurement with that for scow measurement 25 per cent. will be allowed for increase by scow mea surement, or 4 yds. *in situ* will be considered equal to 5 yds. in scows.

7. METHOD OF WORKING.—The precise location of the work shall be fixed by the Engineer in charge, or his assistants. The line shall be plainly marked by stakes or range marks. He will also keep a plainly marked tide-gauge in view of each dredge while at work, set so that the proper depth of excavation may at all times be attained. The level of mean low water shall be established at the beginning, and shall not be changed during the progress of the work. The contractor shall be responsible for the care and preservation of the line stakes, marks and gauges. He shall pay for all loss or delay arising from the loss or injury of any of the said stakes, marks or gauges, occurring through the action of his employés or agents, and he shall not be paid for any excavation beyond the limits assigned him. The scows must in all cases be loaded over the bank and not over the dredged channel. An allowance of 9 inches in depth will be made for extra depth, and no excavation below the depth of 16¾ ft. shall be paid for. The excess shall be determined be examinations made by the Engineer or his assistants, at suitable intervals behind each dredge.

In case a deficiency in depth is found the contractor shall, upon notification, redredge the bottom till the required depth is obtained.

The contractor will be required to furnish board and lodging for one Inspector on each dredge, the cost of which will be included in the price paid for dredging.

8. GENERAL INFORMATION.—Bids are invited for removing and dumping the materials in the manner described, by the cubic yard, measured in scows or measured *in situ* and deposited on the land. The bidder to furnish all the machinery and appliances for doing the work. Bidders will state in their proposals the date at which they propose to begin the work, and amount of work which they propose to do each month, also the kind, capacity, number and condition of the dredges and appliances they propose to use. These will be subject to the inspection and approval of the Engineer in charge. It is also to be understood that in any contract which may be entered into for the performance of the work in question, that the whole work shall be subject to the scrutiny of the Engineer in charge, and shall be performed to his entire satisfaction.

The United States will not be responsible for any damage that may occur during the progress of the work, either to the contractors' plant or to passing vessels.

Corrosive Action of Cement Upon Metals.

MR. J. C. TRAUTWINE, the late eminent American engineer, published a brief memorandum shortly before his death, giving the result of some experiments which he had made to determine the corrosive action of hydraulic cements upon metals embedded in them. The cements used were English, Portland, and Louisville, in addition to which he tried plaster of Paris pure and also mixed with equal measures of the cements. All were of the consistency of common mortar, and all were kept in an upper room during ten years, unexposed to moisture other than that of the indoor atmosphere. The metals were partly embedded in the plaster and partly projected from them. They consisted of cut iron nails, some of which were galvanised, smooth iron wire nails, brass in both sheet and wire, zinc in sheet copper wire and solid cylinders of lead 38-in. diam ter The result at the end of the ten years was that all the metals in both the pure cements were absolutely unchanged, and this was also the case with the plaster of Paris, with the exception of the ungalvanised nails, which had become covered with a thin coating of rust, as were also those in the mixtures of plaster and cement, but to a less degree. Mr. Trautwine concludes from his experiments that if dampness be excluded, both cement and lime mortar will protect from injury all the metals employed in ordinary constructions for an indefinite time.

CORRESPONDENCE.

Calculation of Ordinates.

Special Correspondence Engineering News.

MANCHESTER, VERMONT, Aug. 28, 1884.

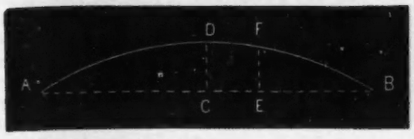
EDITOR ENGINEERING NEWS.—Actuated by motives akin to those which inspired the happy Preface to Mr. Wm. F. Shunk's "Field Engineer," I should be pleased to submit to the Professor, through your columns, the appended demonstration and rule relative to the Calculation of Ordinates.

The method itself may not be unknown to some of your readers, as it came to me second-hand. The demonstration was suggested by the 4th Article of Chap. XIX. of the work above referred to (its appropriation here is with the knowledge and consent of the author), and in order that it may come within the understanding of, and be made available by trackmen as well as engineers, I leave nothing to be inferred or puzzled over after the first assumption—which is merely the application of principles to facts and may be taken upon faith.

Yours very truly,

E. P. ROBERTS,
Mem. Am. Soc. Civ. Engrs.

TO CALCULATE ORDINATES.



$A\,D\,F\,B$ = an arc of a 1° curve
$A\,B$ = chord of 100 feet
$C\,D$ = middle ordinate = Y
$E\,F$ = any ordinate = y
$A\,E$ = any distance X, say 60 feet
$E\,B$ = any distance X^1, or 40 feet

It is a property of the parabola that ordinates vary as the products of their abscissas. This property may be assigned to the circle in cases where the arc encloses a small angle.

Applying it here, we have,

$$CD : EF :: (A\,C \times C\,B) : (A\,E \times E\,B)$$

or $$Y : y :: (50 \times 50) : X\,X^1$$

or $$Y \times X\,X^1 = y \times (50 \times 50)$$

or $$y = \frac{Y \times X\,X^1}{2500}$$

or $$y = \frac{Y}{25} \times \frac{X}{10} \times \frac{X^1}{10}$$

As Y is here the middle ordinate of a 1° curve, and as X and X^1 have their specific values, we have by insertion

$$y = \frac{.218}{25} \times \frac{60}{10} \times \frac{40}{10}$$

or $$y = .00872 \times 6 \times 4$$

or $$y = .872 \times .6 \times .4$$

or $$y = .872 \times .24 \qquad (= .20928)$$

but .872 is the tangential deflection of a 1° curve—hence any ordinate is equal to the product of the segments of the chord (expressed in stations or decimals of stations) multiplied by the tangential deflection of the curve.

Water Way of Culverts.

Special Correspondence Engineering News.

PHILADELPHIA, Sept. 1, 1884.

EDITOR ENGINEERING NEWS.—In reply to a recent inquiry regarding the water way of culverts, I would refer your readers to a discussion on this subject published in the Proceedings of the Engineers' Club of Philadelphia, Vol. I, Nos. 3 and 4, in which Mr. Rudolph Hering, while agreeing that Major Myers' formula will give good results under certain conditions shows that it neglects the fact that a proper opening is dependent upon the rainfall and upon the velocity of discharge—the latter depending in turn on the character and inclination of the channel.

In place of this Mr. Hering proposes the form

$$Q = f\,r\,\rho\,\sqrt{2g \sin.\,a}\,.\,b.$$

in which

r = average depth of rainfall upon the area.
f = fraction of rainfall flowing off.
a = angle of average slope.
ρ = co-efficient of resistance to the water flowing over the ground.
b = average breadth of widest portion of *rain* area whose length equals the average distance (which a particle of water flows during the entire storm, from the average slope and measured along the flow line) and measured on a curved line intersecting the lines of flow at right angles.

This formula, which he claims to be theoretically correct, cannot be used before determining experimentally the above co-efficients for different conditions. As a substitute he proposed for present practice the following formulas which agree fairly with nearly all published flood records.

Let

Q = cubic feet per second.
M = square miles.
M' = " acres.

Then

1° for flat rural countries

$$Q = 1300\sqrt{M+4} - 2600 + 0.2\,M$$
$$= 50\sqrt{M'+2500} - 2500 + 0.00037\,M'$$

2° for hilly countries

$$Q = 1700\sqrt{M+1.68} - 2200 - 0.1\,M$$
$$= 65\sqrt{M'+1142} - 2200 - 0.0001\,M'$$

3° for *very* favorable conditions for flood

$$Q = 2100\sqrt{M+1} - 2100 - 0.5\,M$$
$$= 83\sqrt{M'+640} - 2100 - 0.00078\,M'$$

Very truly,

KAPPA.

New Thing in Marine Work.

Special Correspondence Engineering News.

BEVERLY, MASS., Sept. 1, 1884.

EDITOR ENGINEERING NEWS.—In the NEWS of Aug. 23 there appears an item in regard to a "New Thing in Marine Work," which needs some comment, as it is by no means a *new* idea.

The floating cofferdam described in that item may be more elaborate in its details than some others, but in general construction it is the same as has been used for many years in the repair of vessels in the harbor of Honolulu, H. I., where there was no dry dock, and other means for raising large vessels entirely out of water are wanting. During the winter of '79 or '80 a large, full-rigged ship of 1400 tons came into port, and was extensively repaired about the stern, and it was done by means of one of these large boxes, in the same manner as described in the News, and with very little displacement of the cargo. The same cofferdam has doubtless done good service in many other cases than the one mentioned above.

FRANK S. DODGE.

The American Society Civil Engineers.

The first regular meeting of the Society after the summer vacation was held on Wednesday evening last, at the House of the Society, 127 E. 23d St., Vice-President Paine in the chair, with Secretary Bogart and thirty members in attendance. The following were elected to the Membership of the Society:

FOR MEMBERS.

Henry Nash Babcock, U. S. Assistant Engineer, New Haven, Conn.; George Herbert Boynton, Assistant Engineer, Chicago, Rock Island and Pacific Railway, Davenport, Iowa; George Hamilton Browne, Superintendent and Chief Engineer, Pittsburgh Water Works, Pittsburgh, Pa.; Moses Burpee, Engineer, Chicago, Milwaukee and St. Paul Railway, Milwaukee, Wis.; Frederick Armand Camp, Civil Engineer, Minneapolis, Minn.; Louis Prevost Evans, Resident Engineer, Works of Cofrode and Saylor, Pottstown, Pa.; Desmond Fitzgerald, Superintendent Western Division, Boston Water Works, Brookline, Mass.; Carl Gayler, Bridge Engineer of the City of St. Louis, Mo.; William Jackson, Assistant Engineer, Improved Sewerage, Boston, Mass.; Emil Kuichling, Principal Assistant Engineer, Rochester Water Works, Rochester, N. Y.; Olin Henry Landreth, Civil Engineer, Tenn.; George Benjamin Mallory, Civil Engineer, New York City; George Edward Mann, Civil and Mechanical Engineer, Buffalo, N. Y.; John Jay McVean, Civil Engineer, Detroit, Lansing and Northern, and Saginaw Valley and St. Louis Railroads, Ionia, Mich.; Mansfield Merriman, (elected Junior May 12, 1879.) Acting Assistant U. S. Coast and Geodetic Survey, Bethlehem, Pa.; Edwin G. Nourse, Chief Engineer, Chicago and Evanston Railroad, Chicago, Ill.; Thomas Watson Orbison, Superintendent Hydraulic Power Co., Iron Mountain, Mich.; Oberlin Smith, Mechanical Engineer, Ferracute Machine Co., Bringeton, N. J.; Julio Federico Sorzano, Civil Engineer, New York City; Edward Ballinger Taylor, Superintendent, Pittsburgh, Cincinnati and St. Louis Division, Pittsburgh, Cincinnati and St. Louis Railway, Pittsburgh, Pa.; Joseph Nelson Tubbs, Chief Engineer, Rochester Water Works, Rochester, N. Y.; Robert Lawrence Van Sant, Civil Engineer, Memphis, Tenn.; Frederick Floyd Weld, City Engineer, Waterbury, Conn.

FOR ASSOCIATES.

Edward Buckingham Guthrie, Manufacturer of Iron and Steel Axles, Buffalo, N. Y.; Frank Herbert Howes, In charge Bolt Department, The Harvey Screw and Bolt Co., New York City; George Wellman Parsons, Superintendent Frog Switch and Signal Department, Pennsylvania Steel Co., Harrisburg, Pa.

FOR JUNIORS.

George Alexander Just, Engineer, New Jersey Steel and Iron Co., New York City.

MR. E. B. DORSEY, recently returned from England, called the attention of the meeting to the proposed Exhibition of American Manufactures, to be held in London in 1886; he had an informal invitation to the Society to hold its Convention of 1786 in London during the Exhibition, and stated that a formal invitation would be given in due time.

MR. E. P. NORTH started an interesting discussion by proposing a new by-law to regulate the acceptance and reading of papers at the Annual Convention of the Society. It was soon apparent that the "Annual Convention" of the future is to be an interesting topic for some months to come, and that "improvements" are inevitable. The motion of MR. NORTH, referring to the preparation of papers only, brought out remarks on the general subject of the Convention; it was conceded unanimously that a "reform" was an absolute necessity; as Secretary BOGART stated that he was engaged already on the subject and would have something to offer to the Society shortly, we will await the result of his studies, which are presumably based on inside knowledge of all the circumstances. MR. NORTH withdrew his motion in favor of one appointing a Committee to investigate the question of papers for the Convention.

A very valuable and interesting paper by EDMUND B. WESTON, M. Am. Soc. C. E., on the "Description of some Experiments on the Flow of Water through 2½-inch Rubber Hose, and Nozzles of various forms and sizes, made on the Providence, R. I. Water Works; also, results of Investigations relating to the Height of Jets of Water," was read by the Secretary.

The paper was accompanied by numerous diagrams and tables; an abstract will probably be furnished for early publication, but the complete paper should be secured by every person interested in the subject. MR. WESTON is one of the most careful and diligent investigators in hydraulics of the day, and in the munificiently equipped and well-organized City Engineer's Department of the City of Providence he has unexceptionable facilities for the development of his special study.

MAJOR W. H. KENT is the projector of the "American Asiatic Railway, via Behring Straits." From his account the following points are taking: The line starts from the proposed western terminus of the Canadian Pacific at Fort Simpson, in latitude 54.40, and near the southern boundary of Alaska, following the bend of the coast it reaches Behring Straits, a distance of 1525 miles, through the best portion of Alaska, for which a climate, as mild as that of New Jersey is claimed, to gether with great natural wealth. The Straits, 36 miles wide, are to be crossed by transfer boats, temporarily, ultimately by a tunnel. At Vladiovski, an important port near the mouth of the Amoor, it will connect with the Russian system of Siberian railways, now being pushed through. Thus an all-rail route from Boston to Liverpool will be formed, which will doubtless soon drive the Guion's and Cunarders to the wall.

Engineering News

AND

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THE Fortieth Convention of the Society of Mining Engineers is being held in Philadelphia this week.

The Cause of the Fire at the Jersey City R. R. Station.

A late issue of the *American Gas Light Journal* contains a most interesting account of the causes leading to the fire which destroyed the station of the Pennsylvania Railroad at Jersey City. The account is peculiarly interesting because of the way in which fact and fiction are woven into it. Says the *Journal's* correspondent:

"The space intervening between the passengers' waiting rooms and the bridges or floats to which the ferryboats are fastened—some 50 or 60 ft. in width, and several hundred feet in length—was nothing else than a mere platform, built upon piles or trestlework, and elevated above the surface of the water at a height of from 10 to 20 ft., the elevation varying with the state and strength of the tidal flow. Underneath this platform or wagon way were stretched thousands of feet of iron gas pipes running in almost every conceivable direction; and these conduits, owing to the frequent jarring occasioned by the constant landing of the ferryboats, the rolling of heavily loaded vehicles, combined with the more or less infirm construction of the platform, were continually subjected to abnormal strains. As a consequence, gas leakages often happened, and the large area of space below the platform afforded an excellent receptacle for the collection of an explosive mixture of air and gas, such collection requiring but the aid of contact with a naked spark or light to cause exactly the results that were witnessed on the night in questioned.

These are the facts, and they bear rather heavily on the gas interest. Fiction is then enlisted in the cause of shoving the blame off on to the system of electric lighting. The writer proceeds,

"Now, as to how the dangerous contact was really effected. Underneath this same platform were distributed hundreds of feet of electric wires, and from one of these electrical conductors was generated the spark that ignited the explosive mixture retained below the wagon way. The resulting explosion severed the main pipe leading to the storage tank, from whence is taken the supply of gas for lighting the cars. On this main pipe leading from the forcing pump, situated some hundreds of feet away, there was a pressure of 260 pounds to the square inch, and the highly compressed gas in this main pipe, supplementing the many thousands of cubic feet of gasified air beneath the roadway, rendered destruction certain and complete."

In the above a probable possibility is advanced as a fact, which we take to be the highest order of fiction. The only facts are, that there was a large and highly explosive mixture of illuminating gas under the platform. Beyond that there are only hypotheses as to how the ignition was brought about, and any reasonably ingenious person could think out a half dozen which would be equally probable.

But, admitting that the gas was ignited by short circuiting an electric current and heating the conductor to a red heat, the blame should not be laid upon the system of electric lighting, but upon the practice which permitted the intermingling of the two systems of gas and electricity in such careless manner. Each has its uses as an illuminator; each has a prosperous future before it. But if ignorance is permitted to combine the two so that the destructive power of one is supplemented by that of the other, both interests will go under a cloud.

A moment's impartial thought upon the matter will show that an electric current alone, or with the aid of any of the more commonly occurring phenomena of everyday life, could never produce such an explosion, while a gas main has frequently produced just such explosions, fatal and disastrous in their effects, in years before the much maligned electric light existed outside of the physicists' laboratory. In the use of both gas and electricity there is a liability to fatal accidents. In the case of the latter, however, there is this saving clause,—that a man can only be the victim of his own carelessness. Persons who place themselves in the path of a high tension current very rarely repeat the experiment. But in the average gas accident it is the innocent who suffer. A careless servant or plumber allows the gas to escape into a confined space, some unsuspecting person appears upon the scene, strikes a light and is blown out of the apartment and into the next world, while the man whose carelessness led to the accident continues his destructive career unhurt.

New York City Surveyors.

Among the various departments and dependencies of the New York City Government, there is none to which time and politics have brought more changes than to the semi-official one of City Surveyor.

The aspirant for this title must get some member of the Common Council to introduce a resolution to the effect that "John Doe be appointed City Surveyor." No examination or certificate to prove that the applicant can distinguish a transit from a Gatling gun is required; members of the profession who served their apprenticeship thirty years ago had to pass an rigid examination, but that useful formality is now dispensed with.

After the resolution fixing the status of "John Doe" as City Surveyor has been approved by the Mayor, the new appointee makes oath before the clerk of the County Court, "well and truly to perform the duties of his office," and at once graduates a full-fledged "City Surveyor." But his professional duties are very apt to begin and end with this formality last mentioned, unless he has influence "at court" or is taken into some old and well established firm of surveyors.

Of the making of City Surveyors there is no end. They are ground out by the mill of the Common Council, and drift out upon the cold world, many of them leaving no trace behind. So easily is a resolution of appointment obtained, that there are at this moment a half dozen of them lying in a pigeon-hole of the desk of the Clerk of the Common Council, the happy possessors of which have not taken the trouble to get the papers and take the oath.

The Corporation Manual for 1870 gives, under the heading "City Surveyors," an incomplete list of some thirty names. During the reign of the late lamented Wm. M. Tweed the number rose to one hundred. At the present day there seems to be no one who has any knowledge of the number existing, neither is there any official list kept of them, nor any way of making up such list, other than that of running over the several hundred volumes which contain the record of the Common Council for the last fifty years, and picking out the names of those appointed, and then looking them up in the city directory to make sure that they have not died or "gone West."

The business handled by New York City Surveyors is of two kinds. First, that done for the city government; Second, that upon which they are employed by private parties because of their peculiar fitness and knowledge, and because the law requires that in certain cases none but City Surveyors shall be employed. These laws are, however, so utterly dead and obsolete that there is nothing to prevent this business from going to persons not regular City Surveyors, except the fact that on account of the ease with which that title is captured, all surveyors are City Surveyors.

As far as the city work is concerned, and the dignity of the office, the glory of the City Surveyor has departed. Formerly the Street Commissioner, whose place is partly supplied by the Commissioner of Public Works, had to be a City Surveyor. All the work now under the charge of the Department of Docks, of Sewers, the Park Commision, and the Croton Aqueduct Commission fell to the City Surveyor as such, and the appointment, with its preliminary examination, represented a certain amount of technical skill and knowledge. But by way of compensation, the volume of business from private parties has increased immensely, and constitutes by far the greater source of revenue to the profession. In real estate litigations, in disputes over boundary lines, in the planning of buildings, and in the grading and filling in of lots his services are called into requisition. If a man wishes to mortgage his city residence, he must first have it surveyed to make sure that he owns the four walls surrounding it. For it has often happened that in buying a twenty-five feet house out of one of the city blocks put up on speculation, subsequent surveys have proved that the twenty-five feet specified in the deed include but one boundary wall, and in some cases the astonished property holder has discovered that he has no walls on either side, and that he is suspended in mid-air, literally "dependent upon the neighbors for support." It is needless to say that no large mortgage-holding concern, like the Mutual Life Insurance Company, will accept a building of that description as a collateral.

There are, perhaps, a half dozen old and well established firms which have almost a monopoly of this latter class of business. Among the most prominent of these are, Wm. V. Smith & Bro., 93 Nassau Street; Austin D. Ewen, 229 Broadway; Ammerman & Ford, 8 James Street; James E. Serrell, 310 West 51st Street; Jacob Rudolphy, Lexington Avenue, corner 57th, and S. E. Towle, 25 Chambers Street.

The first of these firms has been in the business nearly a century and has some five thousand maps of property surveyed, while others date back to 1807, and collectively they possess a body of records which concern the entire real property of New York. They have their private marks which are affixed to work done.

and each has a special line of work and a number of regular customers, which furnish the bulk of their practice. Mr. Ewen does all the work for the Astors and Trinity Church Corporation; Mr. Smith has nearly all the city work; Messrs. Ammerman & Ford and the Towles have a large number of lawyers among their clients. There have also been men in the business who, not content with the work which came to them of itself, have attempted to get up "corners" in surveying. A noticeable instance of this occurred in the laying out of Williamsburg, L. I. The entire survey was made by one family of surveyors. At night the senior member and his sons, armed with transit and lantern, would go out and reset the stakes, sinking them two or three feet beneath the surface, and, after making a note of their positions, cover them up again, thus making a family secret of every boundary line in Williamsburg. As a result, when other surveyors were subsequently employed they we e unable to find the original land-marks and had to make various assumptions which were more or less correct and many of the boundary lines of Williamsburg are to-day from one inch to three feet "out of the way."

The ordinance under which City Surveyors are appointed dates back to 1793. Sections 113 and 114 of the revised Corporation Ordinances are as follows:

SECT. 113. There shall be so many surveyors appointed for the city as the Common Council shall, from time to time, think proper, whose duty it shall be to assist the Commissioner of Public Works in laying out and regulating all the streets and roads of the said city; and to lay out and survey all ground for the purpose of building upon, and to advise and direct concerning the same.

SECT. 114. The said surveyors, so to be appointed, before they respectively enter upon the execution of the said office, shall take an oath well and truly to execute the same.

SECT. 115. No person shall erect any building bounded by any of the public streets or avenues on his, her or their ground, unless the same be previously viewed and laid out by the said surveyors or one of them; nor in any other manner than they, or one of them (with the advice and consent of the Commissioner of Public Works) shall direct, under penalty of fifty dollars for each offence.

This was passed in 1793, but the penalty was only five pounds sterling. In 1805, it was raised to $50. Even this amount is not sufficient to bankrupt a person preparing to erect a ten thousand dollar building. The law is, however, practically dead, and no attention is paid to it.

SECT. 117. For laying out each lot other than the corner of any street or avenue and giving a certificate thereof, the said surveyor or surveyors shall be entitled to demand and receive from the owner or owners thereof the sum of $1.50; and for every corner lot of any street or avenue, the sum of $2.50.

It is evident at first sight that this is a ridiculously small fee compared with the prices of to-day. It has remained unchanged—and probably unnoticed as far as compliance with it is concerned—since 1817. The original ordinance of 1793 fixes the price at eight shillings. In 1805 it was reduced to $1.50 for any lot, and in 1807 the distinction regarding corner lots was made. At present, and for a long time past, the law is, and has been, a dead letter. The regular price for surveying a lot is $10 with a discount for more than one. The Ewens charge $15 for a single lot, and the actual outlay in time and labor amounts to something over $7.00.

Another source of income is defined in section 119. This ordinance was passed in 1823 and has reference to the erection of walls along the street line. It has fallen into utter disuse.

SECT. 119. Upon any one of the city surveyors being duly notified as aforesaid, it shall be his duty to examine such wall and to give such directions as may be necessary to prevent encroachments upon the streets; and for every such service he shall be entitled to demand and receive from the owner of such wall the sum of $1.

Taking up the class of work done for the city government, Section 120 of the ordinances provides that

"Whenever in the proper administration of the duties of his office the Commissioner of Public Works may require the services of a City Surveyor, he shall have authority to employ such one of the City Surveyors as he may appoint for the purpose."

It is evident that those who are unfortunately beyond the personal horizon of the Commissioner of Public Works will not be overburdened with this class of work. The rate of compensation is, of course, fixed by law, and as it is expressly provided that no more than the legal price shall be allowed, and no bills paid unless certified to by the Commissioner of Public works, the tariff has been revised from time to time to keep up with the general advance in values.

The original basis of payment for street work was 4 cents per lineal foot and included laying out, regulating, paving, making profile of work and a map showing number and breadth of lots adjoining with names and numbers of occupants. In 1821, it was reduced to 3 cents per foot and remained at that figure until 1859 when the following sections were introduced into the corporation ordinances:

SECT. 121. No City Surveyor employed by the Department of Public Works, shall receive compensation therefor at a greater rate than as follows, nor shall any surveyor's bill be paid unless the same be first certified to by the Commissioner of Public Works.

For a preliminary survey in regulating a street or avenue, or for making a country road, for the first line of levels, 3 cents per lineal foot, measuring through the centre of the street, avenue or road; and for every additional line of levels, one cent per lineal foot, to be measured in the same manner.

For a preliminary survey in filling in sunken lots, $1.50 per lot of 2500 sq. ft.

For grading, when done alone, 5 cents per lineal foot, measuring through the centre of the street or avenue.

For grading and setting curb and gutter, when done under the same contract, 8 cents per lineal foot, measuring through the centre of the street or avenue.

For grading, setting curb and gutter and flagging, when done under the same contract, 11 cents per lineal foot, measuring through the centre of the street or avenue.

For setting curb and gutter alone, 3 cents per lineal foot along the line of the work done.

For setting curb and gutter and flagging, when done under the same contract; but not in connection with the grading, 4½ cents per lineal foot, along the line of the curb.

For flagging, when done alone, 3 cents per lineal foot, along the line of work done.

For setting stakes, making final survey, etc., in the filling of sunken lots, $1.50 per lot of 2,500 sq. ft.

For fencing, including the preliminary survey, 3 cents per foot.

For making a country road, 10 cents per lineal foot, measuring through the centre of the road.

For establishing a new grade line, one cent per lineal foot, measuring along the line, for assessment lists, and maps, 3 cents per lineal foot of map front; it being understood in every case that the surveyor shall furnish a duplicate list and map without additional charge.

A surveyor employed by the Commissioners of Public Works to make a survey, the compensation for which is not otherwise provided for, shall receive such compensation as shall be certified by the commissioners of Public Works.

SECT. 122. In all cases where the same is required, a projection or profile, and such drawings and calculations shall be furnished to the Commissioner of Public Works as may be required by him, without extra compensation. A surveyor shall be entitled to receive payment for a preliminary survey on the completion of the same to the satisfaction of the Commissioner of Public Work. He shall receive payment for the other services mentioned in this paragraph on the completion of the work and its acceptance by the Department of Public Works.

SECT. 123. The amount paid for any of the services mentioned in the last section, whenever the same shall have been rendered in relation to any improvement or work for which an assessment may afterwards be made, shall be included in such assessment.

SECT. 124. A surveyor shall be entitled to receive $10 for every certificate to a contractor, which shall be paid by the Commissioner of Public Works; the amount so paid for such certificate shall be deducted from the payment to be made to the contractor on account of the work certified to be done.

The repaving of streets is now done by the Engineers of the Croton Aqueduct.

The condition of affairs described above, is curious, and not altogether flattering to the municipal administration of New York. Here are a number of ordinances more than a half century behind the times in their provisions which are regularly neglected and violated; and which, if enforced, would drive every surveyor out of the business, so unjustly would they bear upon him. The question of their legality is also one upon which there seems to be a diversity of opinion, one lawyer stating that a City Surveyor could be compelled to accept the legal fee of $1.50 in full liquidation of his claims for surveying a lot, while there are cases on record in which City Surveyors have sued for and recovered the full amount of their charges.

There are several salaried positions filled by City Surveyors. Mr. J. B. Bacon occupies that of inspector for the Comptroller. The duties of this position are to inspect all contract work for which bills are sent into the Department of Public Works before such bills are paid by the Comptroller; Mr. Eugene McLean has charge of the city's real estate; and Mr. Wm. T. Black, in the service of the Board of Assessors, makes and keeps on file maps of all assessable property in the city.

Irrigation by the Government.

Mr. Lester F. Ward, in a communication to *Science*, reviews the advantages which would accrue to lands in the valleys of the Upper Missouri and Yellowstone, from a grand system of irrigation; and proposes that, as private capital is too scarce in that region, and territorial government too weak to undertake this vast project, the National Government appropriate a few hundred millions and put the scheme through in one grand job. Mr. Ward fears the power of the grasping monopoly which his prophetic vision sees in the future, carrying out this great project of irrigation only to "impede settlements by excessive water rates, and deter population and jeopardize industry by endless litigation and conflicting legal decisions;" these latter being supposed to grow most rankly under the protection of grasping monopolies.

It is hardly probable that a corporation which conducted business on the principles shadowed forth by the above would live long enough to accomplish much evil in the world. Methods of that nature could result only in financial suicide. Colorado is being developed by powerful and enterprising irrigation companies and as yet there are no complaints of the "grasping monopoly" order. When the time comes, these or similar corporations will do btless take the valleys of the Missouri and Yellowstone in hand and bring the 5,000,000 acres, which represent the combined irrigating capacity of these streams, under cultivation.

The principle of government interference in matters which can be left to private enterprise, is foreign to republican institutions. The revenues and expenditures in channels of administration simply have reached a figure in this country which subjects the honesty of the average official to a severe strain, and an undertaking of this nature would degenerate into a steal of the first magnitude. Contractors and lobbyists would rob the Government; office holders and politicians would rob the settler. Admitting the possibility of a grasping private monopoly, its influence would be less baneful than that of the political rings to which the other plan would give rise.

IT is now definitely settled that the Cincinnati, Wabash and Michigan Railroad will build an independent line from Anderson, Ind., its present southern terminus, to Indianapolis. For several years this road has been dependent upon the Cleveland, Columbus, Cincinatti and Indianapolis line for its southern and western outlet.

Steel Rails for Horse Railroads.

A Western exchange remarks on the praiseworthy spirit of enterprise which the Sixth Avenue Horse Railroad of this city is displaying in laying steel rails over its lines. We were under the impression that the steel rail was as much at home on the horse railroad as upon the more pretentious roads where steam is the motive power, and a little investigation proved that our esteemed cotemporary was just ten years behind the times in its remarks on this head.

About the year 1874 the Sixth Avenue Co. imported from England a cargo of 50 lbs. steel rails at a cost of $120 per ton, and laid them upon its line in Carmine St., where they remain at the present day. Every line in the city is now provided with steel rails. The Pennsylvania Steel Works at Harrisburg has gone into their manufacture and the last quotations were about $37.00 a ton. The excess in cost over the ordinary steel rail is due to several causes. There is less competition; being lighter there are more rails to the ton, and more labor is expended in rolling, straightening and shipping a ton of them. A greater number of spike holes have to be punched, etc. The life of a steel rail for city use is generally put at twenty years. The chief source of wear is the abrasion by cart wheels rather than of the wheels of the cars themselves. The point at which the rail fails is the spike holes. No matter how firm the stringers may be when first put down, the pounding of heavy wheels drives the rail into it, and the dirt getting in under the spike head begins to grind out the hole under the springing action of the rail. The spike suffers also, but is soon drawn out and replaced by a new one, which eats still further into the hole, until finally the rail becomes worthless from this cause though otherwise uninjured. Some of the pieces of the old rails used on the Third Ave. road were of such fine quality of steel that they have been worked over into edged tools by the employés of the road.

Panama Canal.

Work done in July	- -	866,600 cu. yds.
Total work to July 30, 1884		9,670,000 " "

PERSONAL.

WESLEY A. LUMM, ex-City Civil Engineer of Sandusky, Ohio, committed suicide on Aug. 28, at his residence, by taking morphine.

OBITUARY.

JOHN LEISENRING, of Mauch Chunk, Pa., died on August 22nd, aged 65 years, Bright's disease being the immediate cause of his death. Mr. LEISENRING was born in Philadelphia in 1819, and went to Mauch Chunk in 1828. At 17 years of age he was a civil engineer, working under the late Asa Packer. He assisted in building the Belvidere Delaware Railroad, as well as the first railroad from White Haven to Wilkesbarre, the Morris Canal and the Lehigh Coal and Navigation Company's canals; but his masterpiece of engineering was the construction of the iron bridges crossing the Lehigh and Delaware rivers at Easton, Pa. He was one of the first to engage extensively in the coal business. He organized many coal companies, and was president of several. He built the famous Switchback Railroad to convey coal mined by himself and others. In 1859 he was superintendent of the Lehigh Coal and Navigation Company. He was a director of the Central Railroad Company of New Jersey and president of the Connellsville Coke and Iron Company. In 1844 he was married to Caroline Bertsch, whom he survived with four children, named E. B. Leisenring, of Audenrien; Mrs. Dr. Wentz, Jr., of Jeddo: Mrs. M. S. Kemmerer and JOHN Leisenring, Jr,, of Mauch Chunk. MR. LEISENRING was of a generous, kind-hearted nature, and an ardent public-spirited man. His acts of charity and beneficence will long be remembered in the vicinity of Mauch Chunk. He had accumulated great wealth, leaving an estate valued at nearly $3,000,000.

SINCE the close of the war, the State of Louisiana has expended $12,731,625.46 on her system of levees. Of this amount $887,970.56 has been paid out since April, 1882, for 130 miles of them requiring 2,699,636 cubic feet of earth.

WORK on top of the Washington Monument is being carried on at night by the aid of electric lights from the top of the Treasury Building and the tower of the Smithsonian Institute.

TURNOUTS:

Exact Formulæ for their Determination, together with Practical and Accurate Tables for Direct use in the Field.*

BY W. B. PARSONS, JR., C. E., ROADMASTER NEW YORK AND GREENWOOD LAKE DIVISION, ERIE RAILWAY.

(*Continued from page* 104.)

Table No. 12.—Bills of Switch Timbers for Frog No. 12.

18-*in. Centres.*			22½-*in. Centres.*		
PIECE.		LENGTH.	PIECE.		LENGTH.
1	6" × 8" ×	8' 5"	2	6" × 8" ×	8' 6"
2	"	8' 6"	2	"	8' 7"
2	"	8' 7"	1	"	8' 8"
1	"	8' 8"	1	"	8' 9"
2	"	8' 9"	2	"	8' 10"
2	"	8' 10"	1	"	8' 11"
1	"	8' 11"	1	"	9' 0"
1	"	9' 0"	1	"	9' 1"
2	"	9' 1"	1	"	9' 2"
1	"	9' 2"	1	"	9' 3"
1	"	9' 3"	1	"	9' 4"
2	"	9' 4"	1	"	9' 5"
1	"	9' 5"	1	"	9' 6"
1	"	9' 6"	1	"	9' 7"
1	"	9' 7"	1	"	9' 8"
1	"	9' 8"	1	"	9' 9"
1	"	9' 9"	1	"	9' 10"
2	"	9' 10"	1	"	10' 0"
1	"	9' 11"	1	"	10' 1"
1	"	10' 0"	1	"	10' 2"
1	"	10' 1"	1	"	10' 3"
1	"	10' 2"	1	"	10' 5"
1	"	10' 3"	1	"	10' 6"
1	"	10' 5"	1	"	10' 8"
1	"	10' 6"	1	"	10' 9"
1	"	10' 7"	1	"	10' 10"
1	"	10' 8"	1	"	11' 0"
1	"	10' 9"	1	"	11' 1"
1	"	10' 10"	1	"	11' 3"
1	"	10' 11"	1	"	11' 4"
1	"	11' 0"	1	"	11' 6"
1	"	11' 2"	1	"	11' 7"
1	"	11' 3"	1	"	11' 9"
1	"	11' 4"	1	"	11' 11"
1	"	11' 5"	1	"	12' 1"
1	"	11' 7"	1	"	12' 3"
1	"	11' 8"	1	"	12' 4"
1	"	11' 9"	1	"	12' 6"
1	"	11' 11"	1	"	12' 8"
1	"	12' 0"	1	"	12' 10"
1	"	12' 2"	1	"	13' 0"
1	"	12' 3"	1	"	13' 2"
1	"	12' 4"	1	"	13' 4"
1	"	12' 6"	1	"	13' 5"
1	"	12' 7"	1	"	13' 7"
1	"	12' 9"	1	"	13' 9"
1	"	12' 10"	1	"	13' 11"
1	"	13' 0"	1	"	14' 1"
1	"	13' 1"	1	"	14' 3"
1	"	13' 3"	1	"	14' 5"
1	"	13' 4"	1	"	14' 7"
1	"	13' 6"	1	"	14' 8"
1	"	13' 7"	1	"	14' 10"
1	"	13' 9"	1	"	15' 0"
1	"	13' 10"	1	"	15' 2"
1	"	14' 0"	1	"	15' 4"
1	"	14' 1"	1	"	15' 6"
1	"	14' 3"	1	"	15' 8"
1	"	14' 4"	1	"	15' 10"
1	"	14' 5"	1	"	16' 0"
1	"	14' 7"			
1	"	14' 9"	63		731'.0" lin.
1	"	14' 10"			=2924 ft. B.M.
1	"	15' 0"			
1	"	15' 1"			
1	"	15' 3"			
1	"	15' 4"			
1	"	15' 6"			
1	"	15' 7"			
1	"	15' 9"			
1	"	15' 10"			
1	"	16' 0"			
79		916'.9" lin.			
		=3667 ft. B. M.			

Table No. 13.—Bills of Switch-Timbers for Frog No. 13.

18-*in. Centres.*			22½-*in. Centres.*		
PIECE.		LENGTH.	PIECE.		LENGTH.
1	6" × 8" ×	8' 5"	2	6" × 8" ×	8' 6"
2	"	8' 6"	2	"	8' 7"
2	"	8' 7"	1	"	8' 8"
2	"	8' 8"	2	"	8' 9"
2	"	8' 9"	1	"	8' 10"
1	"	8' 10"	2	"	8' 11"
2	"	8' 11"	1	"	9' 0"
2	"	9' 0"	1	"	9' 1"
1	"	9' 1"	1	"	9' 2"
2	"	9' 2"	1	"	9' 3"
1	"	9' 3"	1	"	9' 4"
1	"	9' 4"	1	"	9' 5"
2	"	9' 5"	1	"	9' 6"
1	"	9' 6"	1	"	9' 7"
1	"	9' 7"	1	"	9' 8"
1	"	9' 8"	1	"	9' 9"
1	"	9' 9"	1	"	9' 10"
2	"	9' 10"	1	"	10' 0"
1	"	9' 11"	1	"	10' 1"
1	"	10' 0"	1	"	10' 2"
1	"	10' 1"	1	"	10' 3"
1	"	10' 2"	1	"	10' 5"
1	"	10' 3"	1	"	10' 6"
1	"	10' 5"	1	"	10' 8"
1	"	10' 6"	1	"	10' 9"
1	"	10' 7"	1	"	10' 10"
1	"	10' 8"	1	"	11' 0"
1	"	10' 9"	1	"	11' 1"
1	"	10' 10"	1	"	11' 3"
1	"	10' 11"	1	"	11' 4"
1	"	11' 0"	1	"	11' 6"
1	"	11' 2"	1	"	11' 7"
1	"	11' 3"	1	"	11' 9"
1	"	11' 4"	1	"	11' 11"
1	"	11' 5"	1	"	12' 1"
1	"	11' 7"	1	"	12' 3"
1	"	11' 8"	1	"	12' 4"
1	"	11' 9"	1	"	12' 6"
1	"	11' 11"	1	"	12' 8"
1	"	12' 0"	1	"	12' 10"
1	"	12' 2"	1	"	13' 0"
1	"	12' 3"	1	"	13' 2"
1	"	12' 4"	1	"	13' 4"
1	"	12' 6"	1	"	13' 5"
1	"	12' 7"	1	"	13' 7"
1	"	12' 9"	1	"	13' 9"
1	"	12' 10"	1	"	13' 11"
1	"	13' 0"	1	"	14' 1"
1	"	13' 1"	1	"	14' 3"
1	"	13' 3"	1	"	14' 5"
1	"	13' 4"	1	"	14' 7"
1	"	13' 6"	1	"	14' 8"
1	"	13' 7"	1	"	14' 10"
1	"	13' 9"	1	"	15' 0"
1	"	13' 10"	1	"	15' 2"
1	"	14' 0"	1	"	15' 4"
1	"	14' 1"	1	"	15' 6"
1	"	14' 3"	1	"	15' 8"
1	"	14' 4"	1	"	15' 10"
1	"	14' 5"	1	"	16' 0"
1	"	14' 7"			
1	"	14' 9"	69 pieces.		804'.1" lin.
1	"	14' 10"			=3216.3 ft. B. M
1	"	15' 0"			
1	"	15' 1"			
1	"	15' 3"			
1	"	15' 4"			
1	"	15' 5"			
1	"	15' 7"			
1	"	15' 8"			
1	"	15' 10"			
1	"	16' 11"			
1	"	16' 0"			
86		999'.3" lin.			
		=3997 ft. B.M			

LITERATURE.

Transactions and Proceedings of the American Society of Civil Engineers. June, 1884.

CONTENTS:—Address of the President of the Society, D. J. Whittemore, at the Annual Convention at Buffalo, N. Y., June 10, 1884. On the Comparative Liability to, and Danger from, Conflagrations in London and American Cities, Edward B. Dorsey.

The address of President Whittemore has already been given in full in ENGINEERING NEWS. Mr. Dorsey takes as the text for his paper the rather unfavorable published interviews with the Chief of the London Fire Brigade, who visited the United States in 1882. The London press infers that their fire service is more efficient than that in this country and hence accounts for the greater frequency of conflagrations in the United States.

Mr. Dorsey emphatically denies the inferiority of the American fire service, and proves by an exhibit of the comparative area, density of population, humidity of the atmosphere, etc., of London and New York, taken as typical cities of the two countries, that other causes prevail. He says that the London firemen are greatly aided by extraneous advantages, which briefly summarized are:

The small size of the majority of the houses.

The low, strong and well braced walls.

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The high and effectual fire wall separating houses.

The use of more brick and stone and less wood in buildings.

Absence of all frame buildings.

Absence of all wooden out-buildings, fences, etc.

Fire proof roofing, slate or tiles.

The prevailing moist or wet climate.

The division of the city into distinct fire districts by the Thames River and the various parks.

The mildness of the winter climate, decreasing the intensity of domestic heating.

The great care of the authorities in prohibiting the manufacture or storage of combustible material in the populous districts.

And the very few overhead telegraph wires to interfere with the firemen.

Contrasting the above summary with the existing state of affairs in New York, or in any of our large American cities, it is evident that our fire departments can not be held answerable for the notoriously extensive conflagrations of this country.

THE HISTORY AND STATISTICS OF AMERICAN WATER-WORKS.

BY J. JAMES R. CROES, M. AM. SOC. C. E. : M. INST. C. E.

(*Continued from page 105.*)

DCLXXIV. QUINCY, MASS.

Quincy, Massachusetts, in lat. 42° 15′ N., long. 71° W., is on a crescent-shaped plain bordering on Massachusetts Bay and surrounded by high granite hills.

It was formerly a part of the town of Braintree and was settled in 1640. It was incorporated as the town of Quincy in 1792.

Water works were built, in 1883, by a private company after plans of A. H. Howland and Phinehas Ball, the supply being taken from ground and surface water. A well of brick laid in cement 30 ft. in diameter and 28 ft. deep is sunk in a saturated bed of gravel, lying in the narrow outlet of a water-shed of about 3,000 acres, and furnishes enough water for the present demand. A provision for the future is made by leading the water of Town Brook, a stream which during the dry year of 1883 had a minimum flow of 400,000 gallons in twenty-four hours, through a filter bed of screened gravel in which 6 in. drain pipes are laid in 16 rows 250 ft. long, the top of each joint being cemented and the bottom left open, the pipes being so spaced that each is surrounded by 10 in. of gravel, and the surface of the gravel being 42 in. below the water level in the brook, and discharging it into an intercepting well from which its flow into the pump well is controlled by gates.

From the well the water is pumped by two Deane pumps, one a high pressure duplex of 24 in. steam and 14 in. water cylinder and 18 in. stroke, and the other a compound condensing duplex of 16 and 30 in. steam and 14 in. water cylinder and 24 in. stroke, having a combined capacity of 4,000,000 gallons daily, lifting 220 ft. to a wrought-iron stand pipe 35 ft in diameter and 60 ft. high.

Distribution is by 22 miles of cast-iron and lap-welded wrought-iron pipe of 20 to 4 in. diameter with 85 fire hydrants, 170 gates and 200 taps. Service pipes are of tarred wrought-iron. The town pays $35 yearly for each hydrant. The works were put in operation Jan. 28, 1884.

The population, in 1880, was 10,570; it is now said to be 14,000. The capital stock of the company is $125,000 and its bonded debt $125,000 at 6 per cent.

The works have cost $237,000.

C. L. Porter is President of the company, and Frank E. Hall, Superintendent.

DCLXXV. RED WING, MINN.

Red Wing, Goodhue Co., Minnesota, in lat. 44° 35′ N., long. 92° 35′ W., is on the Mississippi River.

Settled in 1850, it was incorporated a city in 1854.

Water-works were built by the city in 1883 after plans of H. B. Wilson, C. E., and H. H. Harrison, C. E., and under the direction of G. E. Beach, taking the supply from the river. The water passes from the river to two wells, in the first of which it runs through screens, and in the second is filtered through sponge, thence a cast-iron conduit of 14 in. diameter, and 800 ft. long, conveys it to the pump well and it is then pumped by an independent, duplex, light-pressure, non-condensing Blake pump of 20 in. steam and 12 in. water cylinder and 24 in. stroke, to a reservoir 18 ft. wide, 20 ft. deep and 400 ft. long, excavated in the side of a rock bluff lined with brick laid in cement and being 235 ft. above the pumps and 210 ft. above the city.

Distribution is by 6½ miles of cast-iron pipe of 14 to 4 in. diameter with 50 fire hydrants and 35 gates.

Service pipes are of lead and wrought-iron.

The population, in 1880, was 5,876.

The works will cost $85,000. The bonded debt is $85,000 at 5 per cent.

G. E. Beach is Superintendent.

WATER.

THE City Councils of Dalton, Ga., propose to build Water Works.

THE Deland Water Works Company of Deland, Fla., will erect Water Works at that point.

THE City Councils of Easton, Md., are preparing to erect Water Works.

THE City Councils of Franklin, Tenn., contemplate the erection of Water Works.

THE Water Works Company of Hot Springs, Ark., are improving works and adding machinery.

SURVEYS and estimates are being made for two lines of pipe from Wenham Lake, a proposed additional source of water supply for Salem, Mass.

A RECENT investigation by the water board of Boston has developed the fact that the entire drainage of the town of Marlboro empties into the sources of the Sudbury River.

WATER Works are to be erected at Morehead, Ala., by the Watts Coal and Iron Company, of Warrior Station, Ala. Eugene Morehead, President.

AN artesian well is to be sunk at Fort Randall, Dak., as soon as a contract can be made with responsible well borers.

THE Commissioner of Public Works announces that the New York City water supply will be increased by the tapping of the Bronx River this week.

MR. T. E. CRIDER has been appointed superintendent of the Hamilton, Ohio, Waterworks for a term of three years.

MEXICAN WATER SUPPLY.

From the graphic verbal description of a friend, who has had engineering experience in Mexico, we illustrate four characteristic types of Mexican water supply.

CULIACAN.

In Culiacan the distributer is an Indian boy and his water-ladened donkey or "burro." The water is carried in a pair of leather panniers, made of flat pieces of hide sewn together at the sides and lower ends. The "stop-cock" is the ingenious feature in the outfit; this is ox-horn with the point projecting out of a hole in the bottom of the panniers; when the water is to be tapped, the attendent pushes in the point of the horn and holds it until the required amount has been emptied into the kerosene can which does duty for a water pail.

BACHIMENTO.

At Bachimento, the patient donkey carries four "ollies," or wide mouthed earthen jars, each containing about two and one-half gallons, supported in a rude basket of wood. The superintendent of the works in this case is usually an Indian girl, who directs the movements of Mr. Burro through the medium of a stout stick.

ALTATA.

The Altata Water Works are more ambitious; a mule and a man and a fifteen-gallon keg form the outfit. The keg is reinforced on the heads and a stout spike driven into the centres. A double lariat of hide connects the high pommel of the Mexican saddle with the water cart, and away they go to the thirsty consumer. The broad-rimmed hat with its highly ornamented band is an important and never-failing adjunct in this method of supply.

MISSION INDIANS.

The last sketch illustrates an ancient and time-honored manner of transporting the precious fluid; it is a scheme as old as the Pharoahs but still fashionable among the Mission Indians of Mexico. Water obtained under these circumstances must necessarily be a highly-prized and, perhaps, sparingly-used luxury.

AN enamel for coating the inside of pipes has been patented by the Eisenhüttenwerk Marienhütte, near Kotzenau. It consists of a thin solution of lime, clay and silicates applied to the pipes during the process of casting, when in a state of great heat. This coating withstands the action of carbonic acid, which is contained in some waters, and which operates on the iron and forms oxhydrate of iron. Tests of four days' duration of the enamelled and non-enamelled pipes gave, for the former, 4 grammes per cubic metre, and for the latter, 301 grammes per cubic metre.

SAN ANGELO, Tex., has an ice factory in operation. The machine used is a De la Vergne, and the water is pumped by a Davidson Steam Pump of a capacity of 36,000 gallons in 24 hours.

THE reservoir of the Watertown Water Works is to be of iron. There will be 14 miles of main, the largest 10 in. in diameter. The pipe, which is of cast-iron, will be brought to Watertown and there lined with cement. The firm of Goodhue & Burney, of Springfield, have the contract for laying the pipe.

THE Water Works built for the town of Newton, Kan., under charge of Mr. T. S. Moorhead as engineer, are completed and have satisfactorily stood the tests to which they were subjected. They are upon the storage reservoir system, with a high service tank of 400,000 gallons' capacity.

TORONTO, Sep. 4.—County Judge Boyd this afternoon gave his decision in the case against the Holly Mfg. Company, of Lockport, N. Y., acquitting them entirely of any complicity in the attempts to bribe the members of the City Council to vote for the acceptance of their tender to supply pumping engines. His Honor expressed the opinion that the report of bribery was originated by irresponsible persons running to reporters with tales for which there was no foundation.

THE Curtis Regulator Co., of Boston, has recently furnished the Davidson Pump Co. with a 12-in steam pressure regulator to be used on a set of pumping engines for the purpose of taking steam from a battery of boilers at 65 lbs. pressure, and delivering it automatically at 25 lbs. pressure to the pumps, thus running two sets of pumps at different pressures from one set of boilers.

THE South Australian Government is obtaining definite information with reference to a scheme propounded by Mr. G. Martin for the conservation of water in the hills in the neighborhood of Gawler, by throwing a large dam across the Para, so as to impound 6,000,000,000 gallons of water. The colonial hydraulic engineer (Mr. Mestayer), the conservator of water (Mr. Jones), and an engineer who has had extensive experience of water conservation works, have paid a visit to the spot at which Mr. Martin suggests the water should be impounded; and the engineer has been set at work to make a thorough examination of the country by boring and otherwise, with a view of ascertaining the holding capacity of the ground, the best place in which to construct the dam, the probable cost, and the quantity of water which may be impounded.

THE Chief Engineer of the Philadelphia Water Department is about to try the experiment of purifying the water supplied to the city by subjecting it to a course of aerification. The plan proposed is to subject a stream of the water as it passes through a main about 500 ft. long, which runs from the pumps to the reservoir, to a charge of air which will be forced into the main by one of the turbine pumps, which will be altered into an air-pump for the time being. It is claimed that the air will destroy at least some of the impurities of the water, and the proportion which it is intended to subject the water to will be four parts air to one of water. After the experiment, samples of the water as aerated and the water as now supplied will be furnished Professor Leeds for analysis and comparison.

THAT ancient cause of grumbling among residents and holiday tourists, the undrinkable water of Venice, appears, from the report of our Vice-Consul, Mr. De Zuccat, to be now at an end. Eight years ago a concession for bringing water from the mainland was granted to an association of English capitalists, who subsequently transferred it to a French company, by whom the project has just been brought to completion at a cost of 5,000,000 of francs. The great aqueduct passes under the Lagoons. By the terms of the arrangement the municipality pays the water company 100,000 francs a year for the supply of good water to the 120 public wells in the city, which are to remain open three hours a day; but after sixty years the whole of the water-works will become the property of the city. Private families are supplied with water at the price of about sixpence (60 centesimi) per thousand litres, equal to about 240 gallons.

IN the town of Bunzlau, in Silesia, which is a type of many German towns, hollowed wood still does duty, in part, for the water mains; 65 to 90 mm. in thickness. It is, however, intended to gradually replace them by cast-iron pipes, earthenware having been tried and found wanting. The total network is 10,127 running meters. Only a few of the houses have the water laid on, and in these cases it has to be raised by handwork to the cisterns; water-closets are very rare in consequence. The sewers in the inner town were laid as far back as 1559, and are bricked and vaulted. They serve, of course, the single purpose of drains. The new sewers are of a square shape, the sole being egg-like. Earthenware pipes, glazed within and without, of a through width of 0.40 to 0.50 m., have been satisfactorily employed. The new sewers only receive rain and household water; a special permission being required for connecting soil pipes. The sewer waters are used in irrigation on a plain of 1,475 hectares in extent in the outskirts of the town. Information as to the disposition of the solid sewage matter is wanting.

NEWS OF THE WEEK.

Miscellaneous.

THE contract for repairing the Levee at Davis' Crevasse, La., has been given to Mr. S. L. Janes. In a week 350 to 400 men will be at work upon it.

MESSRS. WILSON & HUNTING of Baltimore, have received the contract for furnishing timber and spiles for the new Government buoy wharf to be erected at Fort Monroe.

THE contract for dredging the channels leading to Baltimore Harbor has been awarded to the American Dredging Company of Philadelphia, Pa.

CLAPP & JONES Manufacturing Company of Hudson, N. Y., has been awarded the contract for furnishing Washington, D. C., with three steam fire engines.

WORK was commenced on excavations for the foundation of the Kings County Elevated Road in Brooklyn, Sept. 1st, but was stopped on account of a legal technicality.

THE West Brighton Beach elephant, a triumph of engineering, architectural, zoological and physiological science, is nearly completed.

THE contract for turning the partly completed jail building at Camden, N. J., into a courthouse, has been awarded to Charles Johnson for $18,000.

BIDS were opened Friday, the 22d ult., for the construction of a new annex building at the Soldiers' Home. The lowest bid was that of Robert Downing of Washington, D. C., at $63,902.

BRYAN & MACDONALD'S steam shovel, on section 12 of the Baltimore and Ohio Railroad, Philadelphia extension, 14 miles from Baltimore removed 994 carloads, or 1,494 cubic yards of dirt in nine hours on Wednesday, Sept. 3d.

THE contract for building a 192-foot sewer on Carson street, Southside, Pittsburg, at the foot of the Castle Shannon Inclined Railway, was awarded to Booth & Flinn, whose bid was $5 19 per foot for the sewer, $15 for one manhole, and $6 per yard for 8 cubic yards of masonry.

By latest advices it seems probable that the firm of Norcross Bros. will get the contract for erecting the new courthouse at Pittsburg. Their bid is $2,233,200.00 against $2,409,445.87 by Booth & Flinn; $2,557 300.00 by Fred. Gwinner, $2,788,107.00 by Butz & Schreiner, and $2,369,516.40 by the Hallowell Granite Company.

THE Spartansburg Union and Columbia Railroad is upon the market. It is highly probable that the East Tennessee, Virginia and Georgia Railroad will purchase the former road and finish the link of 23 miles from Hendersonville to Asheville, N. C., which is already graded and ready for the iron.

GEORGE W. TOWNSEND of Boston has been awarded the contract for removing Gangway Rock in Portsmouth outer harbor. This work is directly under the control of Col. C. E. Blunt, U. S. E., and requires the breaking up and removal of about 800 cubic yards of sunken ledge to a depth of 20 feet at low water.

THE report of Major Powell, director of the United States geological survey, for the year ended June 30, shows that the most work has been done in the North Atlantic and South Atlantic districts. Five triangulating parties have been kept in the Appalachian region. In the great basin of the West a detailed map has been made of Lake Mono, for the purpose of showing its remarkable glaic and volcanic features.

PROPOSALS opened at the office of Colonel Wm. P. Craighill, U. S. Engineer, for building the foundations and the pier and abutment of a movable dam at lock No. 6, on the Great Kanawha River, W. Va., about four miles below Charleston contained the following bids:

Harrold & McDonald, Pittsburgh, $102,060.50.
Keefer & Dull, Lewistown, Pa., $136,102.50.
M. D. Burke, Cincinnati, $123,160.
J. H. Wingate, Wytheville, Va., $128,990

THE contracts for continuing the work on the Potomac River improvement having been awarded, operations will be at once begun. Mr. Somers has the contract for making the embankment and dredging along the reclaimed ground. The contractors for dredging the Washington channel, Benson & McNee, have their plant in San Francisco, but their representative is now in Philadelphia arranging for an iron dredge to be built. They expect to begin work inside of the next ninety days.

WORK on the Rice St. iron bridge, at St. Paul Minn., will be commenced at once.

AN item from an exchange stating that an Edison dynamo was running an elevator in South Street, sent a representative of the *News* on a tour of investigation, for if electrical engineering had produced a motor which could be reversed, stopped and started as frequently as the work of an elevator requires, we wanted to chronicle the fact and describe the apparatus. The report proved to be pure moonshine. The Edison Company have several machines running printing presses but have not yet tackled the elevator problem.

AN exchange is responsible for the following: "Prof. Douglass, of the Michigan State University, produces amateur cyclones at will by suspending a large copper plate by silken cords. This plate is charged heavily with electricity, which hangs down like a bag underneath, and is rendered visible by the use of arsenious acid gas, which gives it a green color. The formation is a miniature cyclone, as perfect as any started in the clouds. It is funnel-shaped, and whirls around rapidly. Passing this plate over a table, the cyclone snatches up copper cents, pith balls and other objects, and scatters them on all sides."

The following is an abstract of the bids opened by Supervising Architect Bell for stone and brick work on the post office, &c., at Jefferson City, Mo.:

Smith, Sargent & Co., stone, $36,760; brick, $16,714.
M. A. McGowan, stone, $49.700.
J. H. Macnamara & Co., stone, $65,500; brick, $20,000
Buehrle & Trippensie, brick, sample No. 1, $24,000; No. 2, $19,500.
The awards will be made next week.

THE following is a schedule of the bids received for dredging Mobile Harbor, Ala.:

George C. Forbes & Co., Mobile, Ala., per cubic yard 11½c.
James E. Slaughter and John H. Gardner, Mobile, Ala., per cubic yard 10 74-100c.
Rittenhouse Moore, Mobile, Ala., per cubic yard 10c.
American Dredging Company, Philadelphia, Pa., per cubic yard 14c.
Tobias Burke, Mobile, Ala., 9c.
S. N. Kimball, Apalachicola, Fla., per cubic yard 12½c,
John A. Benson and J. H. McNee, San Francisco, per cubic yard 15c.
Contract awarded to Tobias Burke.

THE following is a synopsis of the bids received for dredging 40,000 cubic yards, more or less, of mud, clay, sand, &c., from the natural channel through Sandusky Bay and through the "outer bar" to deepen same:

George Talbot, New York, per cubic yard, 24c.
George W. Sheldon, Toledo, Ohio, 22c.
L. P. and J. A Smith, Cleveland, Ohio, 21c.
Wm. E. Rooney, Toledo, 18c.
John Stang and Quarters Gillmore, Lorain, Lorain County, Ohio, 17½c.
Edwin French, Fulton, N. Y., 25c
Contract awarded to Stang and Gillmore.

THE following abstract of proposals for the extension of the Burlington Breakwater have been received by the Chief of Engineers, from Lieutenant Colonel H. M. Robert:

David W. McConnell, Buffalo, N. Y., 235,000 feet b. m. hemlock, per M, $23; 165,000 feet b. m. white pine, per M, $34.50; 240 feet b. m. white oak, per M, $50; stone, 9,000 cubic yards, per yard, $1.50; 4,800 pounds screw bolts, 3¾ cents per pound; 34,000 pounds drift bolts per pound 3¼ cents; 320 pounds wrought iron spikes, per pound, 3¾ cents. Total, $25,906.50.
Wm. Patrick, Phœnix, N. Y., hemlock, $28; white pine, $30; white oak, $50; stone, $1.28; screw bolts, 4 cents; drift bolts, 3 cents; spikes, 5 cents. Total, $24,290
Luthur Whitney, Keeseville, N. Y., hemlock, $25; white pine, $30; white oak, $40; stone, 40 cents, screw bolts, 15 cents; drift bolts, 3 cents; spikes, 6 cents. Total, $20,813.80.
Contract awarded to Luthur Whitney

THE contracts for laying sewer pipes in the City of Washington have been awarded as follows:

To F. P. Murphy, 12-inch pipes at $1.03 per lineal foot; 24-inch pipes at $1.49 per lineal foot.
To John Cudmore, 15-inch pipe at $1.07 per lineal foot.
To Owen O'Hare, construction of 20 receiving basins, more or less, and pipe connections at prices aggregating $1,385.
The remaining bids opened August 16 and not already awarded are rejected, viz: bids for 18-inch sewer pipe and for 2 inch by 3 inch 2.50 inch by 3 inch, and 75 inch by 3 inch brick sewers. This work will be immediately readvertised.

No proposals were received in response to advertisements for improvements on Big Sandy river.

THE following are the bids opened by Mayor Hains for dredging in the Potomac River.

150,000 cubic yards in trench and embankment, section 3—Morris & Cummings Co., New York, 22 cents per cubic yard, total $33,000; Atlantic Dredging Co., Brooklyn, N. Y., 13½ cents, total $30,250; Ross & Sanford, Jersey City, N. J., 11 cents, total $16,500; D. Constantine, Baltimore, Md., 12 3-10 cents cubic yard, total $18,450; Thos. P. Morgan, 15 4-10 cents cubic yard, total $23,000; Frank C. Somers, Philadelphia, Pa., 10⅛ cents cubic yard, total $15,937.50. Contract awarded to Mr. Somers.

Washington Channel—D. E. Culver Co., $208,125; Rittenhouse Moore, Mobile, Ala., $154,683.50; Benson & McNee, San Francisco, £123,700; Ross & Sanford, Jersey City, N. J., $209,843.75; National Dredging Co., Wilmington, Del., $236,220. The contract has been awarded to Benson & McNee.

THE following is a schedule of the bids for furnishing cast-iron water pipes and special castings to the District of Columbia.

A. H. McNeal, who was awarded the contract for 70 per cent. of pipe and special castings, bid in detail as follows: 132,812 tons of 12 inch pipe, $4,462.48; 196,875 tons of 10-inch pipe, $18,647.14; 10 tons special casting, $616; aggregating, $340.62.

The Camden Iron Works, bid $30,375.20, and the Gloucester Iron Works, $30,740.82 for the same articles.

F. C. Viney, who made no deposit, bid on 30 6-inch two way water gates and boxes. His bid was $2,250.

John McClelland, who was awarded the contract for all the articles bid on by him bid as follows: Fifty fire plugs, $3,500; 30 6-inch two way water gates and boxes, $1,380; 30 6-inch four way water gates and boxes, $2,180; 3 10-inch two way water gates and boxes, $210; 2 12-inch two way water gates and boxes, $160.

THE Bridge which the Surburban Rapid Transit Co. are building across the Harlem River, at 129th street and second avenue is to consist of two fixed spans 100 feet in length and a 245 feet draw, together with a considerable length of trestle work on the Harlem side. The contracts for the iron work have not yet been given out, but Messrs Drake Dwight & Co., have been at work upon the masonry for some time. Mr. T. Cooper is the engineer having the matter in hand,

Two iron bridges are to be constructed, one at Fort Worth, Tex., to cost $16,000, by the building Committee of the Clear Creek bridge, and another to cost $67,000, at Eagle Pass, Tex.

A COMPANY with $12,000 capital has been formed in Wabash having for its object the improvement of the Wabash and Erie Canal between La Cro and Wabash. Work will be begun in a few weeks.

United States Engineer L. V. Hoag, Jr., who is in charge of the Government work on the Allegheny river, has divided the improvement work into seven divisions, five of which have been let as follows: From Pittsburg to Freeport to John Hudson, from Freeport to Kelly's station to Joseph Hudson, from Kelly's to Kittanning to Thomas J. Hudson, from Kittanning to Mahoning to Henry S. Crawford, and from the latter place to Parker to Daniel F. Fry. The special survey and examination for the location of Dam No. 1, on the Allegheny river, between the Sixteenth street bridge and Herr's Island, is being made by a party of engineers under Mr. Hoag's special supervision.

THERE are at present four large iron piers, similar in general pattern to that at Long Branch, being built in the harbor of Havana. Their dimensions are 330 ft. × 33 ft. and there is a depth of 30 ft. of water at their extremities. The passenger and freight service, which they are intended to accommodate, has heretofore been compelled to put up with the slow system of lighterage. The supporting piles are being sunk by the hydraulic method, a special make of the Deane Steam Pump being used. The foundation is a conglomerate of coral which solidifies on being exposed to the air, and renders the work a little difficult. The tide rises and falls about 1 ft. 6 in. in this vicinity. The iron work is furnished by the Phœnix Iron Company. The Contract work is in the hands of C. O. Richards & Co., of this city. Mr. J. C. Van Horne is the engineer in charge.

The length of the entire structure of the Louisville and Nashville Railroad bridge over the Ohio at Henderson, Ky., will be over four miles. The channel span is to be 525 feet in length the longest truss span in the world by a few feet and, 52 feet above high water level. The bridge proper will be 3,686 feet long. There will be three miles of trestle work on the Indiana side, which together with the Kentucky approches make the four miles stated. Caissons are being used in the work of laying the foundations. This work was taken in hand by the railroad company on April 15th of this year, owing to the slow progress made by the contractors prior thereto. But four of the foundations had been secured, and three caissons rested on the river bed out of position, three feet out of level and ten feet below the surface of the water. Great expense and delay was occasioned in recovering these sunken caissons. Seven foundations are now secured, and work is being done on all of the fifteen foundations. Pier No. 2 has been finished, piers 3 and 4 will be completed this month, and piers 5 and 6, the large piers of the channel span, will be completed by October 1st. The timber trestles for the first span of iron work are up, and two of the bridge spans will be erected by September 10th. Nine hundred and twenty men were employed during the month of July. About 300 of these were at work in compressed air. The foundations for nine river piers are sunk by pneumatic process to a depth of thirty feet below low water. In two instances eight feet of this distance is through solid rock. The caissons are all bedded in the rock of the river bed. The rock-work has made the process of sinking slower than usual in pneumatic work. About 100 yards of stone are delivered daily, and the masonry is laid as fast as secured. More than 1,500,000 feet of white oak timber and 450 tons of iron have been used in the nine caissons of the river piers. More work has been done in stone during this season than has been accomplished by the contractors in two years work, and five of the piers are now above the highest flood stages of the Ohio. The stage of the river makes the months of September, October, November, and even December, the most desirable months of the year for laying the masonry and erection of the iron work. The Keystone Bridge Company are busily employed in getting their iron work out, and have a large force of men preparing for its erection. The contractors for railroad, earth and trestle work on the connecting railroad to Evansville have work well in progress. They have a good season for work, and large forces of men and teams and much machinery on the ground.

Railroads and Canals.

GRADING on the Kentucky Union is reported completed from Hedges Station, Ky., to Clay City, Powell county, 32 miles.

THE Cincinnati, Wabash and Michigan will build a line from Anderson, Indiana, to Indianapolis.

A SIXTEEN mile road is projected from Clayton Ga., to Tallulah Falls, by the Northeastern Railroad Company.

A STREET railway company has been formed by the Green Cove Street Railway Company, of Green Cove Springs, Fla.

THE Chattanooga Railway Elevator Company have applied for a charter for a street railway.

THE Pennsylvania will probably repair and iron the grade of the old Mansfield, Coldwater and Lake Michigan railway in Michigan.

A TWENTY FIVE mile railroad will be built by the Mill Sap and Mineral Wells Company, from Mill Sap to Palo Pinto, Tex.

A THIRTY FIVE mile railroad is projected from Madison, W. Va., to Walnut Grove, by the St. Albans and Boone County Railroad Company.

THE Lake Creek R. R. Co., capital $50,000, has been incorporated in Texas by J. E. McComb, O. Hamilton and others.

THE gap in the Louisville, New Orleans and Texas is nearly closed. Steel rails are being laid at the rate of 6,000 feet a day.

A NEW railroad will be built from Cienfuegos to San Diego del Valle on the Island of Cuba.

THE town of Athens, Mich., offers $30,000 and more, if needed, to the first railway company bringing it a railroad.

CANTON, O., Aug. 25.—The Canton, Massillon & Meyer's Lake Railway Co. commenced getting the right of way to-day.

A LARGE lot of steel rails for the Kansas City & Southern road has arrived at Osceola. The work will be pushed rapidly from that point to Clinton, a distance of fourteen miles.

ARRANGEMENTS are said to be about perfected by the Union Pacific to extend their Lawrence branch from Osage County, via Burlington, Toronto, Fredonia and Sedan to the extensive timber belt in the Indian Territory.

THE survey of the Cannon Valley Railroad has advanced as far as Mankato, Minn.

THE Shenandoah Valley Railroad Company, of Waynesboro, Va., have ordered the survey of a line through the Catawba Valley, by way of extending their present line.

JAS. H. SAVAGE, with others, has secured a charter to build a road to be called the Chattanooga, Cross Plains and Gulf Road. Headquarters, Chattanooga,

W. H. DENSON is organizing a company to build a railroad from Anniston to Attila, Ala., to be called the Alabama and Cincinnati Railroad Company. Headquarters, Anniston.

GREENVILLE, Miss., wants the Louisville, New Orleans and Texas to build a branch from Leland, on the main line, to that town, a distance of about 24 miles.

IT is rumored that the Atchison, Topeka and Santa Fe Company are going to extend their road from Kansas City to St. Louis. The route has been partially surveyed.

A LAWSUIT involving several millions of dollars has been recently entered upon by the Pennsylvania Railroad Company against the stockholders of one of its leased roads, the Pittsburgh and Fort Wayne.

IN order to prevent the carrying away of the road-bed by overflows, the Louisville, New Orleans & Texas company has put in 4,000 feet of new trestle between Memphis and Clarksdale, Tenn. The iron bridge over the Sunflower river is completed.

PORTLAND, Or. Aug. 21.—Orders were received to-day from President Harris, of the Northern Pacific, to withdraw the company's rolling stock on the branch from Tacoma to Seattle. This was done and the road is now temporarily abandoned.

HURON, DAK., Aug. 25.—To-morrow surveyors start on the Iowa & Dakota Railroad, which begins in Suily County and runs north along the Missouri River to Bismarck. Largely equipped for the work they will run the line before snow flies.

THE sheds of the Northern Pacific Air-compressor Pump Works used in the construction of the Snake River bridge were burned Wednesday night, August 27th, causing a loss of $50,000.

THE contract for the erection of 14 mile of Superstructure for the Kings County Elevated Railway of Brooklyn has been awarded to the Phœnix Bridge Co. of Phœnixville, Pa. It ts to be completed within two years. This Elevated road will be bonded, as it is stated, for $700,000 per mile, or about $10,000,000 in total.

A PRELIMINARY survey has been made between Wadena and Park Rapids for a line of railroad to be known as the Wadena and Park Rapids road. Col. Crooks, of St. Paul, is President; J. S. Wolverton, of Minneapolis, Secretary; E. S. Case, Wadena, Treasurer. It is proposed to complete the road by December 1, 1885.

THE plan of using the enormous water power of the Alps for working electric railways in Switzerland is about to take a definite shape, the idea being to connect the towns of St. Moritz and Pontresina by an electric railway, four and three-quarters miles long, the motive power to be supplied by the mountain streams, the line, in case the plan proves a success, to be extended a considerable distance.

PITTSBURG, Aug. 28.—Judge Atchison in the United States Circuit Court to-day, rescinded the contract of Thomas P. Simpson, of New York, with the New Castle and Northern Railroad, and appointed Christopher Magee, of this city, Master, to make an estimate of the labor already performed by Simpson, and ascertain and report the amount justly due the defendant contractor.

THE Mississippi Valley Railroad has put on a large force of men to repair the "cuts" between Baton Rouge and Vicksburg, which of late have been caving and show signs of blocking the track at any moment. The "cuts" which are the most dangerous will be widened so that two tracks can be put down through them, so that if one bank of the "cut" caves in and obstructs a track another will be free to allow the passage of trains. It appears that both sides of the "cut" never caves at the same time, and in consequence, if there are two tracks through it, the chances are that the movement of trains will not be obstructed. The suspicious "cuts" are being widened to a distance of 40 ft. in order to afford ample room for two tracks, and if the caving still continues, other steps will be taken by the road to prevent it.

A RAILROAD is to be constructed from Bennettsville, S. C., to Shoe Heel.

THE Kansas City, Fort Scott and Gulf road will build a branch 151 miles in length, leaving the main line at a point 28 miles south of Kansas City, through the counties of Cass, Henry, St. Clair, Polk and Green, to a point about 20 miles west of Springfield on Fort Scott, South-eastern and Memphis road.

IT is now stated that the Kentucky Union Railroad, which was under construction and going ahead with a boom a few months ago, and then came to a standstill through the stringency of the money market, is to experience a new boom immediately and have its construction pushed rapidly forward to completion.

FOR several weeks past a force of engineers have been locating a line for a railroad from Leland, on the Louisville, New Orleans and Texas Railroad, to the bank of the Mississippi River Opposite Arkansas City, the terminus of the Little Rock Railroad. The road to be built will be of standard gauge.

THE Fargo, Missouri and Pacific is the name of a company recently organized in Dakota to build a road from Fargo northwest, crossing the Missouri river at Fort Stevenson. The objective point is in Washington territory. It is said that about 25 miles of road will be built this year. The following are the officers of the company: President, C. A. Robert; vice-president, Hugh Moore; treasurer, W. A. Kindred; secretary, E. S. Tyler. Headquarters, Fargo, Dak.

A NEW railroad enterprise, to furnish additional and cheaper traveling facilities between Far-Rockaway, Brooklyn and New York, has been started. Surveys have been made for a line to run along the shore of Jamaica Bay to East New York, a distance of about ten miles, to connect with the Rapid Transit system of Brooklyn. It is intended to have the road built and in operation by June 1, 1885. Among the chief promoters of the plan are J. D. Cheever, Dr. Bradreth and William E. Bailey.

THE Manhattanville, 42nd street and St. Nicholas avenue horse Railroad Company, of which Mr. Daniel Wiley is President, is laying a double track along the route covered by the title Mr. J. B. Trimmings is doing the contract work and is laying a 47 lbs. steel rail. Quicker work has been done upon this than on any similar job. The 42nd street section would have been finished within two days after breaking ground if it had not been for an injunction brought against the company by property holders in the interest of the 3rd avenue Horse Railroad Company.

THE topographical survey and final location of the Burlington, La Fayette & Western road are now finished between La Fayette Ind. and Kokomo, a distance of 42 miles. Two-thirds of the right of way along the line and the proper grounds for stations and side tracks have been acquired. A force of men are engaged clearing the right of way to enable the Western Union Telegraph company to establish its wire along the line ahead of construction and to open an office in each county through which the road passes. Two first-class and four second-class grain and stock shipping stations are located along the line to be constructed by the farming communities in the respective localities, for which monep had been previously subscribed. The engineer corps is now divided up to cross-section the line between the Wabash Junction at Buck Creek and Kokomo, a distance of 34 miles. It is expected that this part of the line will be ready for construction by the first of October next.

THE London Inner Circle Railroad is a marvellous feat of engineering skill. It runs throughout its entire distance under the busiest center of the largest city in the world, and the operations attending the excavation and construction have proceeded without serious injury to or interruption of business or traffic. Quicksands have had to be passed through, beds of old rivers spanned, lofty warehouses and massive buildings secured while their foundations have been undermined, and an intricate network of gas and water pipes sustained until supports had been applied to them from below. Added to this, the six main sewers had several times to be reconstructed. Day and night the work has been carried on for eighteen months, and now the engineers are able to announce that their tunnel is complete. The laying of the rails and the building of the stations are the only portion of the immense work that remains to be done, and in a very short time trains will be passing over the whole of this wonderful subterranean road.

ABSTRACT of proposals for dredging Cape Fear River, N. C., opened at 11.5 A. M., August 28, 1884.

No.	Name.	Address.	How Measured.	Price per cu. yd.	Remarks.
1	Benson & McNee.	San Francisco, Cal.	*In situ.*	18½ cts.	$14 per hour for dredge when removing stumps.
2	Sanford & Ross.	Jersey City, N. J.	In Scows.	14 cts.	
3	Rittenhouse Moore.	Mobile, Ala.	In Scows.	14½ cts.	$100 per day for removing stumps.
4	Geo. C. Fobes & Co.	Baltimore, Md.	In Scows.	14¾ cts.	$15 per hour for stumps.
5	Morris & Cumings Dredging Co.	New York, N. Y.	In Scows.	14⅝ cts.	
6	National Dredging Co.	Wilmington, Del.	In Scows.	12¾ cts. 14¾ cts. 23 cts.	Lilliput Shoal Big Island & Log Shoal Brunswick Shoal } $18 per hour for removing stumps.
7	Thos. P. Morgan.	Washington, D. C.	In Scows.	13 7/10 cts. 24 cts. 18 cts.	Lilliput Shoal. Big Island & Log Shoal. Brunswick Shoal.
8	N. Y. Steam Dredging Co.	New York, N. Y.	In Scows.	17 3/10 cts. 12¾ cts.	For All. $14 per hour for removing Stumps.

ABSTRACT of proposals for furnishing stone for Cape Fear River, N. C., opened at 12.5, P. M., August 28, 1884.

No.	Name.	Address.	Where delivered.	Price per ton.	Remarks.
1	Ross & Lara.	Wilmington, N. C.	At their wharf. Wilmington. At Goot works.	$1.48 $1.55 $1.75	Small. Heavy. "
2	G. Z. French.	Rocky Point, N. C.	Wilmington. At Goot works. At Goot works in 7 feet of water.	$1.48 $1.68 $1.70	Small. " As it runs in quarry.
3	C. H. Edwards.	Boston, Mass.	Smithville.	$3.90	Heavy.
4	Bodwell Granite Co.,	Rockland, Me.	Wilmington.	$2.33 $2.10	Small. Heavy.
5	S. Perkins,.	Boston, Mass.	Wilmington.	$2.37 $2.33	Small. Heavy.
6	Davis Tillson.	Rockland, Me.	Smithville.	$2.15 $1.95	Small. Heavy.
7	F. H. Smith.	New York, N. Y.	Smithville.	$2.94	"
8	A. L. Lockwood.	New York, N. Y.	Smithville.	$1.99½ $2.03½	Small. Heavy.
9	W. F. Haigh.	New York, N. Y.	Smithville.	$2.35	"
10	Cuming & Brown.	New York, N. Y.	Wilmington.	$3.19 $3.05	Small. Heavy.
11	C. A. Brown.	New York, N. Y.	Smithville.	$1.95 $1.95	All.
12	J. S. Howell.	New York, N. Y.	Smithville.	$2.32 $2.32	All.
13	H. P. Gillert.	Georgetown, D. C.	Smithville.	$2.77 $2.97	Small. Heavy.

THE idea of grading for a railroad with a crosscut saw is rather startling. It has actually been done in Sonoma County, California, where a track has been laid on the stumps of trees thus sawed off.

The President of a Cleveland horse railroad company is satisfied with the practical success of the electric system in operation on a portion of his line. He estimates that with an expenditure of $150,000 for the plant—engines, boilers, dynamos, motors and conduits—a saving of over $50,000 a year can be effected over the present cost of operation by horses, besides securing to the company and the public the benefit of rapid transit. The one car now in operation runs on schedule time, but it can be driven at the rate of ten miles an hour.

THE San Francisco *Bulletin* says that over 225 men are now at work on the line of the Humboldt and Eel River Road on Eagle Prairie bluff, which is of sandstone, from 100 to 300 feet high, and about two miles long. The company is digging out a roadbed in the side of the bluff over Eel river, about 8 ft. above high-water mark. About 2,000 pounds of blasting powder are being used each day, and it is thought that this section of the road-bed will be completed in ninety days. Eagle Prairie bluff is about six miles from the end of the Eureka & Eel River company's extension. A 300-foot span bridge will be built across the Van Duzen river on the completion of the Eagle bluff work. After the bridge is finished, which will probably not be until next summer, there will be but little heavy work to do on the line.

VICKSBURG, MISS., Aug. 27.—The corps of engineers that have been surveying for some weeks past on the line of the Vicksburg, Shreveport and Pacific Railroad from Monroe east, reached Mounds' Station yesterday. They are making a survey for the purpose of making estimates for raising the track above high water. F. Y. Dabney, chief engineer and superintendent of the road, has received an allotment of $200,000 from the general manager for that purpose. Capt. Dabney states that the amount will not be sufficient to do the entire work necessary, but will be sufficient to raise the road at the most important points in all low places. There are nine miles of track to be completed to open the entire Louisville, New Orleans and Texas Railroad from New Orleans to Memphis. By the 5th of September, it is thought, trains will be running from New Orleans to Memphis.

CINCINNATI, Aug. 25—The Cincinnati and Eastern Railroad was opened for business today from here to Portsmouth, Ohio, a distance of 103 miles. The road is now narrow gauge but negotiations are in progress to change it to standard gauge.

AN invention destined to revolutionize the railroad world, is the "anti-collision attachment" for single track roads. Heretofore two trains going in opposite directions upon the same track have been unable to pass one another without collision, but with this new attachment it is claimed that it can be done successfully. Take for instance, the Shore Line Road to Boston, a single track. All trains going east can be supplied with this device, which consists of an incline plane running out in front of the locomotive, on the top of which are regular steel rails. These run along over the roofs of the cars and down another inclined plane behind the train onto the road-bed again. The east-bound train proceeds on its way at full speed without regard to the time of the west-bound trains. If it happens to meet one coming at full speed from the opposite direction the latter simply runs up an inclined plane over the roof of the train down onto the road-bed again and continues on its way. The inclined plane is so gradual that the passengers in the eastern-bound train will notice no concussion, the noise only resembling a passing thunder-storm. The passengers in the western-bound train will likewise be oblivious to anything out of the ordinary run, excepting perhaps a finer view of the surrounding country. There is only one drawback to its adoption, and that is the possibility of two trains going over one another immediately under some bridge or street crossings. There would not be room enough, and the bridges would either have to come away or else be supplied with elastic abutments, so as to stretch aloft in case a train should strike and lift them.

It will at once be seen that this device seals the doom of the double track road. With their greater cost of construction they will be unable to compete with single track roads doing an equal amount of business, and must go to the wall. And the traveler of the future, as he goes cavorting across the country over and under express accommodation and way freight, will read of the remains of the four tracked New York Central, and the great Pyramid as similar examples of monumental uselessness and folly.

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